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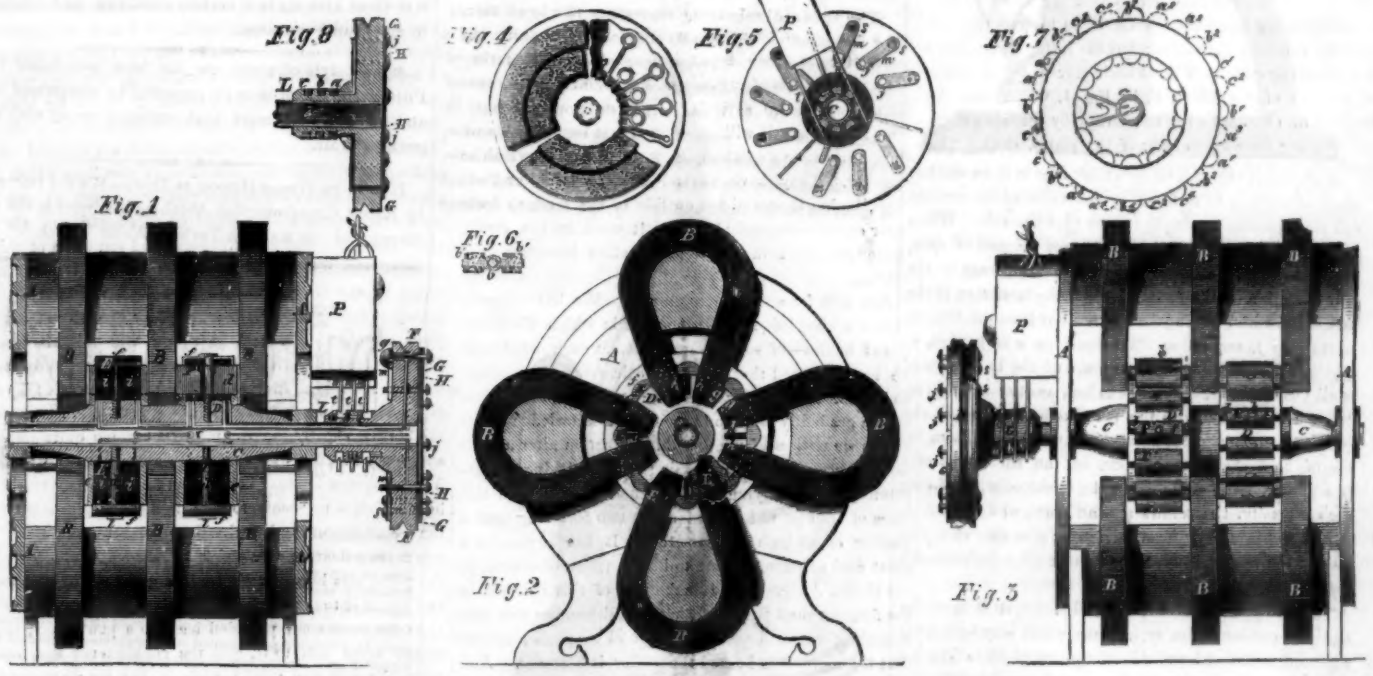
MAGNETO-ELECTRIC APPARATUS.

If a metallic wire, insulated by being covered with silk or other non-conductor of electricity, is wound spirally around a soft iron bar, and the bar is made magnetic by placing the pole of a steel magnet against its end, a wave of electricity flows through the surrounding wire for an instant, but immediately ceases. If, now, the steel magnet is drawn away from the end of the soft iron core, another wave of electricity flashes through the helical wire in the opposite direction to the former. Electricity thus induced by magnetism is called magneto-electricity, and as its production requires no acids or other liquids, it is a convenient way of obtaining a current, and has been extensively used in the cure of diseases. In Way's electrical light, which has attracted so much attention in England, magneto-electricity is employed; the machine being driven by a 2-horse power steam engine. Two forms of magneto-electrical machines are employed; in one, permanent magnets being placed on a wheel and carried by its revolutions past the ends of stationary cores of helical wires; and in the other, helical wires being placed on the revolving wheel and carried past the poles of stationary magnets. The improvements which we here illustrate are applicable to either form of magneto-electrical machine, but the drawings represent them as applied to a machine in which the helices revolve and the magnets are stationary.



BAKER'S IMPROVED MAGNETO-ELECTRIC APPARATUS.

A A, Figs. 1, 2 and 3, are two standards of iron or other material which constitute the framing of the machine, having secured between them the stationary permanent magnets, B B, of which there are twelve arranged in three circles, four in each circle, at equal distances from each other, those of either circle being directly opposite those of the other two circles.

C is the main shaft, working in bearings in the standards, A A, in the center of the circular series of magnets, and having secured to it two wheels, D D*, in each of which there are twelve helices, E E or E* E*, arranged at equal distances apart, making the proportion of helices in each wheel (twelve) to the number of poles (eight) in each circular series of magnets as three to one. The spiral arrangement of these helices in the two wheels with reference to each other is illustrated in Figs. 2 and 3, in both of which figures it is shown that the helices, E E, of the one wheel are opposite to the middle of the spaces between the helices, E* E*, of the other wheel, and *vice versa*. The core, *d*, of each of these helices is composed, as shown in Figs. 2, 3 and 6, but most clearly in the last-mentioned figure, of two pieces of thin, flat, soft iron, swaged in the center to form a cavity for the reception of a screw bolt, *l*, by which the helix is attached to the wheel. The core, thus formed, has the covered copper wire, *i*, wound round it in such a manner as to leave the central cavity clear for the insertion of the screw bolt, *l*, and to leave a portion of the core at each end naked, to be inserted in radial grooves formed in two circular face plates, *e e*, which are secured to the sides of each wheel.

The manner in which the ends of the poles of the magnets are tapered to make their edges parallel with the edges of the cores of the helices as the latter pass them in their revolution, is shown at *g h*, in Fig. 2. In the construction of the magnets care should also be taken that the width of the spaces between the tapered ends or poles of each magnet, and the width of the spaces between the several magnets in the same circular series, should be equal to half the width of the tapered ends or poles, as shown in Fig. 2.

By proportioning the number of helices in each wheel to the number of poles of the magnets in each series, and constructing the magnets and helices as described, only one-third of the helices in each wheel or circular series are acted upon in the same degree at the same time; but the strongest electric impulses from one-third of the helices fill the conducting wire at the same instant that the impulses are weakest from another third, and at rest in the remaining third of that wheel or series; and, as by the spiral arrangement of the helices of the two wheels, the helices of the one and those of the other are brought alternately within the magnetic influences, the electric impulses therefrom alternate in a corresponding manner. Thus this arrangement produces a very constant current.

The intensity regulator consists of a wheel, F, of non-conducting material, which is secured to and rotates with the shaft, and which may be made to constitute the driving pulley. Upon the outer face of this wheel there are secured three pairs of arc-formed plates, G H, of good conducting metal. Only two pairs of these plates are represented in the face view in Fig. 4, as part of said wheel is supposed to be broken away to expose the internal arrangement of wires, but the plates constituting the pair which has been omitted are arranged, one within the other, in the same manner as the pairs represented. The three outer arcs, G, have connected with them one set of the terminal wires (that is to say, all those constituting the positive poles or all those constituting the negative poles) of the helices and the three inner arcs, H, have connected with them the other set of the terminal wires, the said wires all passing through the shaft, C. To avoid an inconvenient multiplicity of connections, the terminal wires of each two corresponding helices in the two wheels are connected in pairs before they are lead through the hollow shaft of the regulator, as shown in Fig. 1, thus requiring in the machine represented only 24 connections with the plates, G H, instead of 48, as would be necessary if each plate were connected independently. By the two corresponding helices of the two wheels is meant the two which, by reason of their arrangement and the arrangement of the magnets, have their currents elicited simultaneously in the same direction. The helices of each wheel are divided into as many series of threes as there are magnets in each circle, making four series in each wheel in the machine represented. This division is illustrated by the diagram, Fig. 7, which represents

the helices of the two wheels, one in full the other in dotted lines, those of one series being marked *a' b' c'*, those of the second, *a2 b2 c2*, those of the third, *a3 b3 c3*, and those of the fourth, *a4 b4 c4*. The helix, *a'*, of one wheel corresponds with *a'* of the other wheel, and the corresponding helices are, in all instances, marked with the same letter on the two wheels. This diagram shows the connection between the two, *a' a'*. The terminal wires of all the helices marked with the letter, *a*, lead to one pair of plates, G H, and the wires of all those marked with the letter, *b*, to another pair of plates, G H, and the wires of all those marked with the letters, *c*, to the third pair of plates. The terminal wire constituting the positive pole of one pair of helices, and that constituting the negative pole of another pair of helices, are connected directly with the two plates, G H, by soldering, as shown at *a' a4* and *b' b4*, in Fig. 4, but the wires of the other helices are connected to the said plates by metal screws, *j j*, which pass through the wheel, F, and fit metal nuts or rings, K K, which are soldered to the ends of the wires and enclosed within the wheel, the said screws all having heads at their outer ends. The plates, G H, have holes large enough to allow these screws to pass through them without contact. On the inside face of the wheel there are secured metal coupling straps, *m m*, to connect the opposite screws in the positive and negative arcs, and thereby to connect, when desired, the helices to which these screws are joined. These coupling straps are so situated as to be each within the reach of two screws of opposite polarity. The screws which pass through the inner plates, H H, screw through the coupling straps, and are always in contact with them, but those which screw through the plates, G G, have the holes provided for them in the coupling straps large enough for them to pass through without touching the straps; but the latter screws have metal nuts or collars, S S, at their rear ends, as shown at the top of the wheel, F, in Fig. 1, which may be brought into contact with the straps by screwing them out to bring their heads clear of the plates, G G. The plates, G and H, are connected with the pole changer each by a single wire, *r*, running through and down the back of the wheel, F, as shown in Fig. 5, and also in the separate section of the pole changer shown in Fig. 8.

The operation of the intensity regulator is as follows: When it is desired to produce a current of low intensity, the screws, *j j*, are all screwed into the wheel, F, to bring their heads into contact with the plates, G H, and thus all terminal wires from the helices are brought into direct communication with the pole changer, producing the same effect as connecting all the negative poles of a series of galvanic cups together, and all the positive poles together. When it is desired to produce a current of high intensity, the screws are all screwed out from the wheel to bring their heads clear of the plates, G H, and bring the collars, S S, into contact with the coupling straps, *m m*, and thus make a connection between the screws of the negative plates, G G or H H, with those of the positive ones, and a consequent connection between the negative terminal wires of the helices and the positive terminal wires of their fellow helices; thus producing the same effect as connecting the positive wire of each cup with the negative wire of the next cup of a galvanic series. In order to produce the very lowest intensity of which the machine is capable, it is obvious that the helices should be separately connected with the plates, G G and H H, and not connected in pairs, as hereinbefore described with reference to Figs. 1 and 7.

The pole changer, L, is made of three broken rings, *x1 x2 x3*, or rings divided into alternating sections of conducting and non-conducting material, two sections of conducting material in each ring to each of the four series of helices hereinbefore described, making eight sections of conducting material in each ring. The two plates, G and H, with which all the helices marked with the letter, *a*, in Fig. 1, are connected, are connected with one ring marked *a*, in Fig. 8, which thus receives all the currents from those helices; and in like manner all the helices marked with the letter, *b*, are connected by another pair of plates, G H, with the second ring marked in Fig. 8 with the corresponding letter; and all marked with the letter, *c*, are connected by the third pair of plates, G H, with the third ring marked *c*. From each of the rings, *a b c*, of the pole changer, L, there leads off to a fixed block, P, of wood two brake-like conductors, *t u*, one positive and the other negative, bearing upon the rings at nearly opposite points. The three positive conducters, *t t t*, are all connected together, and the three negative conductors are all connected together. Thus are connected all the currents and electric impulses with the least possible break or interruption; for, before the connection of the conducting wire with the ring, *a*, of the pole changer is broken, by the intervention of the section of non-conducting material, a connection is made with the *t* ring, and before that is broken a connection is made with the *c* ring, and thus a constant current is insured.

By this arrangement a magneto-electrical machine is obtained which is operated with only the uniform resistance of the friction, and by which the intensity of the current is adjusted at will with the greatest nicety.

The patent for this invention was procured, through the Scientific American Patent Agency, Sept. 4, 1860, and further information in relation to it may be obtained by addressing the inventor, H. N. Baker, or John A. Collier, Esq. (who has an interest in the patent), at Binghampton, N. Y.

SCIENCE MADE POPULAR.

PROFESSOR FARADAY'S LECTURES ON THE PHYSICAL FORCES.

LECTURE III.—COHESION—CHEMICAL AFFINITY.

We will first return, for a few minutes, to one of the experiments made yesterday. You remember what we put together on that occasion—powdered alum and warm water. Here is one of the basins then used. Nothing has been done to it since; but you will find, on examining it, that it no longer contains any powder, but a number of beautiful crystals. Here, also, are the pieces of coke which I put into the other basin; they have a fine mass of crystals about them. That other basin I will leave as it is. I will not pour the water from it, because it will show you that the particles of alum have done something more than merely crystallize together. They have pushed the dirty matter from them, laying it around the outside or outer edge of the lower crystals—squeezed out, as it were, by the strong attraction which the particles of alum have for each other.

And now for another experiment. We have already gained a knowledge of the manner in which the particles of bodies—of solid bodies—attract each other, and we have learned that it makes calcareous spar, alum, and so forth, crystallize in these regular forms. Now let me gradually lead your minds to a knowledge of the means we possess of making this attraction alter a little in its force—either of increasing or diminishing, or, apparently, of destroying it altogether. I will take this piece of iron [a rod of iron about two feet long and a quarter of an inch in diameter]. It has at present a great deal of strength, due to its attraction of cohesion; but if Mr. Anderson will make part of this red hot in the fire, we shall then find that it will become soft, just as sealing wax will when heated, and we shall also find that the more it is heated the softer it becomes. Ah! but what does *soft* mean? Why, that the attraction between the particles is so weakened that it is no longer sufficient to resist the power we bring to bear upon it. [Mr. Anderson handed to the lecturer the iron rod, with one end red hot, which he showed could be easily twisted about with a pair of pliers.] You see, I now find no difficulty in bending this end about as I like, whereas I cannot bend the cold part at all. And you know how the smith takes a piece of iron and heats it, in order to render it soft for his purpose; he acts upon our principle of lessening the adhesion of the particles, although he is not exactly acquainted with the terms by which we express it.

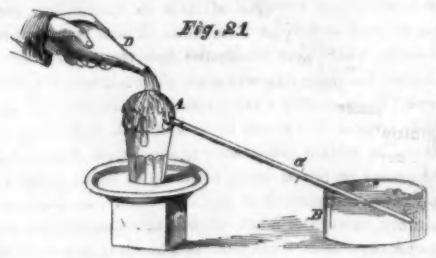
And now we have another point to examine, and this water is again a very good substance to take as an illustration (as philosophers, we call it all water, even though it be in the form of ice or steam). Why is this water hard [pointing to a block of ice]? because the attraction of the particles to each other is sufficient to make them retain their places in opposition to force applied to it. But what happens when we make the ice warm? Why, in that case we diminish to such large extent the power of attraction that the solid substance is destroyed altogether. Let me illustrate this: I will take a red hot ball of iron [Mr. Anderson, by means of a pair of tongs, handed to the lecturer a red hot ball of iron, about two inches in diameter], because it will serve as a convenient source of heat [placing the red hot iron in the center of the block of ice]. You see I am now melting the ice where the iron touches it. You see the iron sinking into it; and while part of the solid water is becoming liquid, the heat of the ball is rapidly going off. A certain part of the water is actually rising in steam; the attraction of some of the particles is so much diminished that they cannot even hold together in the liquid form, but escape as vapor. At the same time, you see I cannot melt all this ice by the heat contained in this ball. In the course of a very short time I shall find it will have become quite cold.

Here is the water which we have produced by destroying some of the attraction which existed between the particles of the ice, for, below a certain temperature, the particles of water increase in their mutual attraction and become ice; and above a certain temperature the attraction decreases, and the water becomes steam. And exactly the same thing happens with platinum and nearly every substance in nature; if the temperature is increased to a certain point, it becomes liquid—and a farther increase converts it into gas. Is it not a glorious thing for us to look at the sea, the rivers, and so forth, and to know that this same body in the northern regions is all solid ice and icebergs; while here, in a warmer climate, it has its attraction of cohesion so much diminished as to be liquid water? Well, in diminishing this force of attraction between the particles of ice, we made use of another force, namely, that of *heat;* and I want you now to understand that this force of heat is always concerned when water passes from the solid to the liquid state. If I melt ice in *other* ways, I cannot do without heat (for we have the means of making ice liquid without heat—that is to say, without using heat as a *direct* cause). Suppose, for illustration, I make a vessel out of this piece of tinfoil [bending the foil up into the shape of a dish]. I am making it metallic, because I want the heat which I am about to deal with to pass readily through it; and I am going to pour a little water on this board, and then place the tin vessel on it. Now, if I put some of this ice into the metal dish, and then proceed to make it liquid by any of the various means we have at our command, it still must take the necessary quantity of heat from something, and in this case it will take the heat from the tray, and from the water underneath, and from the other things roundabout. Well, a little salt added to the ice has the power of causing it to melt, and we shall very shortly see the mixture become quite fluid, and you will then find that the water beneath will be frozen—frozen because it has been forced to give up that heat which is necessary to keep it in the liquid state to the ice on becoming liquid. I remember once, when I was a boy, hearing of a trick in a country ale-house; the point was how to melt ice in a quart pot by the fire, and freeze it to the stool. Well, the way they did it was this: they put some pounded ice into a pewter pot, and added some salt to it, and the consequence was, that when the salt was mixed with it, the ice in the pot melted (they did not tell me anything about the salt, and they set the pot by the fire, just to make the result more mysterious), and in a short time the pot and the stool were frozen together, as we shall very shortly find it to be the case here; and all because salt has the power of lessening the attraction between the particles of ice. Here, you see, is the tin dish frozen to the board; I can even lift this little stool up by it.

This experiment cannot, I think, fail to impress upon your minds the fact that when a solid body loses some of that force of attraction by means of which it remains solid, heat is absorbed; and if on the other hand, we convert a liquid into a solid, *e. g.*, water into ice, a corresponding amount of heat is given out. I have an experiment showing this to be the case. Here (Fig. 21) is a bulb, A, filled with air, the tube from which dips into some colored liquid in the vessel, B. And I dare say you know that if I put my hand on the bulb, A, and warm it, the colored liquid which is now standing in the tube at C will travel forward. Now, we have discovered a means, by great care and research into the properties of various bodies, of preparing a solution of a salt which, if shaken or disturbed, will at once be-

come a solid; and, as I explained to you just now (fo what is true of water is true of every other liquid), by reason of its becoming solid heat is evolved, and I can make this evident to you by pouring it over this bulb. There! it is becoming solid; and look at the colored liquid—how it is being driven down the tube, and how it is bubbling out through the water at the end; and so we learn this beautiful law of our philosophy, that whenever we diminish the attraction of cohesion we absorb heat, and whenever we increase that attraction heat is evolved. This, then, is a great step in advance, for you have learned a great deal in addition to the mere circumstance that particles attract each other.

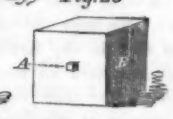
Fig. 21



But you must not now suppose that because they are liquid they have lost their attraction of cohesion; for here is the fluid mercury, and if I pour it from one vessel into another, I find that it will form a stream from the bottle down to the glass—a continuous rod of fluid mercury, the particles of which have attraction sufficient to make them hold together all the way through the air down to the glass itself; and if I pour water quietly from a mug, I can cause it to run in a continuous stream in the same manner. Again: let me put a little water on this piece of plate glass, and then take another plate of glass and put it on the water; there! the upper plate is quite free to move, gliding about on the lower one from side to side; and yet, if I take hold of the upper plate and lift it up straight, the cohesion is so great that the lower one is held up by it. See how it runs about as I move the upper one; and this is all owing to the strong attraction of the particles of the water. Let me show you another experiment. If I take a little soap and water—not that the soap makes the particles of the water more adhesive one for the other, but it certainly has the power of continuing in a better manner the attraction of the particles (and let me advise you, when about to experiment with soap bubbles, to take care to have everything clean and soapy). I will now blow a bubble, and that I may be able to talk and blow a bubble too, I will take a plate with a little of the soapsuds in it, and will just soap the edges of the pipe and blow a bubble on to the plate. Now there is our bubble. Why does it hold together in this manner? Why, because the water of which it is composed has an attraction of particle for particle—so great, indeed, that it gives to this bubble the very power of an india-rubber ball; for you see, if I introduce one end of this glass tube into the bubble, that it has the power of contracting so powerfully as to force enough air through the tube to blow out a light (Fig. 22); the

Fig. 22

Fig. 23



light is blown out. And, look! see how the bubble is disappearing—see how it is getting smaller and smaller.

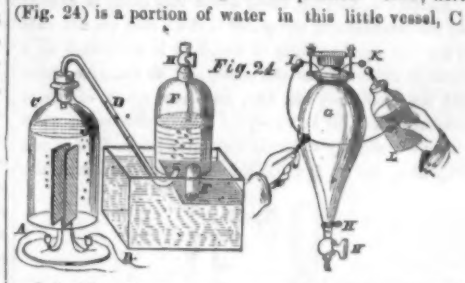
There are twenty other experiments I might show you to illustrate this power of cohesion of the particles of liquids. For instance, what would you propose to me if, having lost the stopper out of this alcohol bottle, I should want to close it speedily with something near at hand. Well, a bit of paper would not do, but a piece of linen cloth would, or some of this cotten wool which I have here. I will put a tuft of it into the neck of the alcohol bottle, and you see, when I turn it upside down, that it is perfectly well stoppered so far as the alcohol is concerned; the air can pass through, but the alcohol cannot. And if I were to take an oil vessel, this plan would do equally well; for in former times they used to send us oil from Italy in flasks stoppered only with cotton wool (at the present time the cotton is put in after the oil has arrived here, but formerly it used to be sent so stoppered). Now, if it were not for the particles of liquid cohering together, this alcohol would run out; and if I had time I could have shown you a vessel with the top, bottom and sides altogether formed like a sieve, and yet it would hold water, owing to this cohesion.

You have now seen that the solid water can become fluid by the addition of heat, owing to this lessening the attractive force between its particles; and yet you see that there is a good deal of attractive force remaining behind. I want now to take you another step beyond. We saw that if we continued applying heat to the water (as, indeed, happened with our piece of ice here), that we did at last break up that attraction which holds the liquid together, and I am about to take some ether (any other liquid would do, but ether makes a better experiment for my purpose) in order to illustrate what will happen when this cohesion is broken up. Now, this liquid ether, if exposed to a very low temperature, will become a solid; but if we apply heat to it, it becomes vapor; and I want to show you the enormous bulk of the substance in this new form: when we make ice into water, we lessen its bulk; but when we convert water into steam, we increase it to an enormous extent. You see it is very clear that, as I apply heat to the liquid, I diminish its attraction of cohesion: it is now boiling, and I will set fire to the vapor, so that you may be enabled to judge of the space occupied by the ether in this form by the size of its flame; and you now see what an enormously bulky flame I get from that small volume of ether below. The heat from the spirit lamp is now being consumed, not in making the ether any warmer, but in converting it into vapor; and if I desired to catch this vapor and condense it (as I could without much difficulty), I should have to do the same as if I wished to convert steam into water and water into ice. In either case, it would be necessary to increase the attraction of the particles by cold or otherwise. So largely is the bulk occupied by the particles increased by giving them this diminished attraction, that if I were to take a portion of water a cubic inch in bulk (A, Fig. 23), I should produce a volume of steam of that size, B [1,700 cubic inches; nearly a cubic foot], so great is the attraction of cohesion diminished by heat; and yet it still remains water. You can easily imagine the consequences which are due to this change in volume by heat—the mighty powers of steam and the tremendous explosions which are sometimes produced by this force of water. I want you now to see another experiment which will, perhaps, give you a better illustration of the bulk occupied by a body when in the state of vapor. Here is a substance which we call iodine; and I am about to submit this solid body to the same kind of condition, as regards heat, that I did the water and the ether [putting a few grains of iodine into a hot glass globe, which immediately became filled with the violet vapor], and you see the same kind of change produced. Moreover, it gives us the opportunity of observing how beautiful is the violet-colored vapor from this black substance, or rather the mixture of the vapor with air (for I would not wish you to understand that this globe is entirely filled with the vapor of iodine).

If I had taken mercury and converted it into vapor (as I could easily do), I should have a perfectly colorless vapor; for you must understand this about vapors, that bodies in what we call the vaporous or gaseous state are always perfectly transparent—never cloudy or smoky; they are, however, often colored, and we can frequently have colored vapors or gases produced by colorless particles themselves mixing together, as in this case [the lecturer here inverted a glass cylinder full of binoxyd of nitrogen over a cylinder of oxygen, when the dark red vapor of hyponitrous acid was produced]. Here, also, you see a very excellent illustration of the effect of a power of nature which we have not as yet come to, but which stands next on our list—CHEMICAL AFFINITY. And thus you see that we can have a violet vapor or an orange vapor, and different other kinds of vapor, but they are always perfectly transparent, or else they would cease to be vapors.

I am now going to lead you a step beyond this consideration of the attraction of the particles for each other. You see we have come to understand that, if we take water as an illustration, whether it be ice or water or steam, it is always to be considered by us as water. Well, now prepare your minds to go a little deeper into the subject. We have means of searching into the constitution of water beyond any that are afforded us by the action of heat, and among these, one of the most important is that force which we call voltaic electricity, which we used at our last meeting for the purpose of obtaining light, and which we carried about the room by means of these wires. This force is produced by the battery behind me, to which, however, I will not now refer more particularly; before we have done we shall know more about this battery, but it must grow up in our knowledge as we proceed. Now, here (Fig. 24) is a portion of water in this little vessel, C

Fig. 24



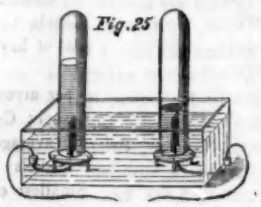
and, besides the water, there are two plates of metal platinum, which are connected with the wires, A and B, coming outside, and I want to examine that water and the state and the condition in which its particles are arranged. If I were to apply heat to it, you know what we should get; it would assume the state of vapor, but it would nevertheless remain water, and would return to the liquid state as soon as the heat was removed. Now, by means of these wires (which are connected with the battery behind me, and come under the floor and up through the table), we shall have a certain amount of this new power at our disposal. Here, you see, it is [causing the ends of the wires to touch]; that is the electric light we used yesterday, and by means of these wires we can cause water to submit itself to this power; for the moment I put them into metallic condition (at A and B), you see the water boiling in that little vessel, C, and you hear the bubbling of the gas that is going through the tube, D. See how I am converting the water into vapor; and if I take a little vessel, E, and fill it with water, and put it into the trough over the end of the tube, D, there goes the vapor ascending into the vessel. And yet that is not steam, for you know that if steam is brought near cold water, it would at once condense and return back again to water; this, then, cannot be steam, for it is bubbling through the cold water in this trough, but it is a vaporous substance, and we must therefore examine it carefully to see in what way the water has been changed. And now, in order to give you a proof that it is not steam, I am going to show you that it is combustible; for if I take this small vessel to a light, the vapor inside explodes in a manner that steam could never do.

I will now fill this large bell jar, F, with water; and I propose letting the gas ascend into it, and I will then show you that we can reproduce the water back again from the vapor or air that is there. Here is a strong glass vessel, G, and into it we will let the gas from F pass. We will there fire it by the electric spark, and then, after the explosion, you will find that we have got the water back again; it will not be much, however, for you will recollect that I showed you how small a portion of water produced a very large volume of vapor. Mr. Anderson will now pump all the air out of this vessel, G, and when I have screwed it on to the top of our jar of gas, F, you will see, upon opening the stop-cocks, H′ H H, the water will jump up, showing that some of the gas has passed into the glass vessel. I will now shut these stop-cocks, and we shall be able to send the electric spark through the gas by means of the wires, I K, in the upper part of the vessel, and you will see it burn with a most intense flash. [Mr. Anderson here brought a Leyden jar, which he discharged through the confined gas by means of the wires, I K.] You saw the flash, and now that you may see that there is no longer any gas remaining, if I place it over the jar and open the stop-cocks again, up will go the gas, and we can have a second combustion; and so I might go on again and again, and I should continue to accumulate more and more of the water to which the gas has returned. Now is not this curious? In this vessel, C,

we can go on making from water a large bulk of *permanent gas*, as we call it, and then we can reconvert it into water in this way. [Mr. Anderson brought in another Leyden jar, which, however, from some cause, would not ignite the gas. It was therefore recharged, when the explosion took place in the desired manner.] How beautifully we get our results when we are right in our proceedings!—it is not that Nature is wrong when we make a mistake. Now I will lay this vessel, G, down by my right hand, and you can examine it by-and-bye: there is not very much water flowing down, but there is quite sufficient for you to see.

Another wonderful thing about this mode of changing the condition of the water is this: that we are able to get the separate parts of which it is composed at a distance the one from the other, and to examine them and see what they are like, and how many of them there are; and for this purpose I have here some more water in a slightly different apparatus to the former one (Fig. 25), and if I place this in connection with the

Fig. 25



wires of the battery (at A B), I shall get a similar decomposition of the water at the two platinum plates. Now I will put this little tube, O, over there, and that will collect the gas together that comes from this side, A; and this tube, H, will collect the gas that comes from the other side, B, and I think we shall soon be able to see a difference. In this apparatus, the wires are a good way apart from each other, and it now seems that *each* of them is capable of drawing off particles from the water and sending them off, and you see that one set of particles, H, is coming off twice as fast as those collected in the other tube, O. Something is coming out of the water *there* (at H) which burns [setting fire to the gas]; but what comes out of the water *here* (at O), although it will not burn, will support combustion very vigorously. [The lecturer here placed a match with a glowing tip in the gas, when it immediately rekindled.

Here, then, we have two things, neither of them being water alone, but which we get out of the water. Water is therefore composed of two substances different to itself, which appear at separate places when it is made to submit to the force which I have in these wires; and if I take an inverted tube of water and collect this gas, H, you will see that it is by no means the same as the one we collected in the former apparatus (Fig. 24). That exploded with a loud noise when it was lighted, but this will burn quite noiselessly; it is called *hydrogen*, and the other we call *oxygen*—that gas which so beautifully brightens up all combustion but does not burn of itself. So now we see that water consists of two kinds of particles attracting each other in a very different manner to the attraction of gravitation or cohesion, and this new attraction we call *chemical affinity*, or the force of chemical action between different bodies; we are now no longer concerned with the attraction of iron for iron, water for water, wood for wood, or like bodies for each other, as we were when dealing with the force of cohesion; we are dealing with another kind of attraction—the attraction between particles of a *different* nature one to the other. Chemical affinity depends entirely upon the energy with which particles of different kinds attract each other. Oxygen and hydrogen are particles of different kinds, and it is their attraction to each other which makes them chemically combine and produce water.

I must now show you a little more at large what chemical affinity is. I can prepare these gases from other substances as well as from water; and we will now prepare some oxygen: here is another substance which contains oxygen—chlorate of potash; I will put some of it into this glass retort, and Mr. Anderson will apply heat to it: we have here different jars filled with water, and when, by the application of heat, the chlorate of potash is decomposed, we will displace the water and fill the jars with gas.

Now, when water is opened out in this way by means of the battery, which adds nothing to it materially, which takes nothing from it materially (I mean no *matter*; I am not speaking of *force*), which adds no *matter* to the water, it is changed in this way—the gas which you saw burning a little while ago, called "hydrogen," is evolved in large quantity, and the other gas (*oxygen*) is evolved in only half the quantity; so that these two areas represent water, and these are always the proportions between the two gases.

1 Hydrogen.	8 Oxygen.	Oxygen.....	88.9
		Hydrogen.....	11.1
	9	Water.....	100.0

But oxygen is sixteen times the weight of the other—eight times as heavy as the particles of hydrogen in the water; and you therefore know that water is composed of nine parts by weight—one of hydrogen and eight of oxygen, thus:—

Hydrogen.....	46.3 cubic inches.....	equal to	1 grain.
Oxygen.....	23.1 "	"	8 grains.
Water (steam).....	69.3 "	"	9 grains.

Now Mr. Anderson has prepared some oxygen, and we will proceed to examine what is the character of this gas. First of all, you remember I told you that it does not burn, but that it affects the burning of other bodies. I will just set fire to the point of this little bit of wood, and then plunge it into the jar of oxygen, and you will see what this gas does in increasing the brilliancy of the combustion. It does not burn—it does not take fire as the hydrogen would—but how vividly the combustion of the match goes on. Again: if I were to take this wax taper and light it, and turn it upside down in the air, it would, in all probability, put itself out, owing to the wax running down into the wick. [The lecturer here turned the lighted taper upside down, when, in a few seconds, it went out.] Now that will not happen in oxygen gas; you will see how differently it acts (Fig. 26). [The taper was again lighted, turned upside down, and then introduced into a jar of oxy-

Fig. 26

gen.] Look at that!—see how the wax itself burns and falls down in a dazzling stream of fire, so powerfully does the oxygen support combustion. Again: here is another experiment which will serve to illustrate the force (if I may call it so) of oxygen. I have here a circular flame of spirit of wine, and with it I am about to show you the way in which iron burns, because it will serve very well as a comparison between the effect produced by air and oxygen. If I take this ring flame, I can shake, by means of a sieve, the fine particles of iron filings through it, and you will see the way in which they burn. [The lecturer here shook through the flame some iron filings, which took fire and fell through with beautiful scintillations.] But if I now hold the flame over a jar of oxygen [the experiment was repeated over a jar of oxygen, when the combustion of the filings as they fell into the oxygen became almost insupportably brilliant], you see how wonderfully different the effect is in the jar, because there we have oxygen instead of common air.

An interesting and curious application of the electric light has recently been made at Schaffhausen, on the Rhine. The famous cascade or waterfall at that place, ninety feet in hight, was illuminated by five electric lamps. The effect obtained was marvellously beautiful, especially when the light was transmitted through red or green glasses. This experiment was made at the instance of the Swiss Railway Company, who propose, if the attempt proves successful, to organise a series of night fêtes next summer, one of the most brilliant features of which will be this illuminated cascade.

CO-OPERATION OF WORKMEN.

One of the best plans yet tried by working men for advancing their interests, is the establishment of manufactories and trading stores by joint association, thus securing to themselves that large share of the wealth produced, which usually goes to the men who conduct enterprises. This has been done to a large extent in England, and we find, in a recent English paper, the following cheering account of the success of some of these associations:—

By far the most interesting portion of the reports of Mr. Alex. Redgrave and Sir John Kincaid relates to the development and extension of co-operative societies for the erection and working of mills in Lancashire, and also to some degree in Yorkshire. These co-operative societies, which have multiplied since the passing of the Limited Liability Act, are generally composed of operatives. Each society has a capital of £10,000 and upward, divided into shares of £5 and £10, with power to borrow in certain proportions to the capital subscribed, the money borrowed being made up of small loans by operatives and persons of the like class. In Bury, for instance, upward of £300,000 will be required to put the co-operative mills there built and building in a working order. In cotton spinning mills, the spinners and persons employed are frequently shareholders in the same mill, working for wages and receiving interest upon their shares. In cotton weaving sheds, the partners frequently hire and work looms. This is attractive to operatives, because no great capital is required to start them in their undertaking. They purchase the yarn ready for the loom, weave the cloth, and the factory operation is completed; or else they receive the yarn from some manufacturer who trades with them, and return to him the woven fabric. But this co-operative system is not confined to the spinning and weaving of cotton. It has extended to the trade on a variety of articles of consumption, such as flour, groceries, draperies, &c.

The following report, drawn up by Mr. Patrick, one of Sir John Kincaid's sub-inspectors, contains some valuable information in regard to the progress of this new system of mill-ownership, which, I am afraid, will be put to a severe test by the next industrial crisis:—

"May 16, 1860.

"There has been a co-operative company in existence at Rochdale, under the style of the 'New Bacup and Wardle Commercial Company,' for about twelve years. They are incorporated under the Joint Stock Companies Act, and unlimited. They commenced operations at Clough House Mill, Wardle, near Rochdale, with power to raise a capital of £100,000, in shares of £12 10s., £20,000 of which was paid up. They then increased to £30,000, and about five years ago built a large factory, Far Holme Mill, near Stackstead, of 100-horse power steam, in addition to Clough House Mill; and the half year ending October last, they paid a dividend at the rate of 44 per cent on the paid up capital (Mr. Patrick reports on the 11th June, that the New Bacup Mill and Wardle Commercial Company, 'Far Holme Mill, Bacup,' have just declared another dividend of 48 per cent on the paid up capital), and they have now increased their capital to the sum of £60,000, and have largely increased their Far Holme Mill, near Stackstead, in this neighborhood, requiring two more engines of 40-horse power each, which they are about to put down. The large majority of shareholders are operatives who work in the factory, but receive wages as workmen, and have no more to do with the management than to give their vote to the annual election of the Committee of Management. I have been through the Far Holme Mill this morning, and can report that, so far as the Factory Act is concerned, it is as well conducted as any in my division. I think, though I did not ask them the question, they have borrowed at 5 per cent interest.

"There has been another in existence in the neighborhood of Bacup about six years, trading under the firm of the 'Rossendale Industrial Association.'

"They built a factory; but, I am told, were not thriving, in consequence of the want of sufficient funds. This also was on the co-operative system. The firm has now been changed to 'The Rossendale Industrial Company,' and are incorporated under the Limited Liabilities Act, with power to raise a capital of £200,000. £40,000 has been taken in shares of £10 each, and they have borrowed about £4,000. This £4,000 has been

borrowed from small capitalists, in sums from £150 down to £10, without any mortgages being given. When this co-operative company first started, every shareholder was an operative. In addition to the Wear mill—that referred to as having been built by the Rossendale Industrial Association—they have now bought of Messrs. B. Mum Bros., Irwell Mills, and are working the two.

"The prosperity and success of the New Bacup and Wardle Commercial Company seem to have given rise to the new companies that are now formed in my immediate vicinity, and preparing large factories to carry on their business. One is the 'New Church Cotton Spinning and Weaving Company,' under the Limited Liabilities Act, with power to raise £100,000 in £10 shares, £40,000 of which is already paid, and the company has borrowed £5,000 on mortgage at five per cent. This company has already started, having taken an unoccupied factory of 40-horse power, Vale Mill, New Church, and they are building the 'Victoria Works,' which will require an engine of 100-horse power. They calculate upon employing 450 people when complete, which they think will be in February next.

"Another is 'The Ravenstall Cotton Manufacturing Company,' also limited, with a nominal capital of £50,000, in £5 shares, with power to borrow to the extent of £10,000. About £20,000 is already paid up, and they are erecting at Hareholme a factory requiring an engine of 70-horse power. I am told that in both of these companies nine-tenths of the shareholders are of the operative class.

"There is another co-operative company which has sprung up within the last six months. 'The Old Clough Cotton Company,' which purchased from Messrs. B. & T. Mum two old mills, called Irwell Springs, and are on the same principle as the others, but not having been able to go there to-day I am not able to give all particulars about it. The power, however, has been returned as 13-horse and the number of hands employed 76, and I believe all the shareholders to be of the operative class.

"There are several who take part of a factory, one or two rooms, as the case may be, and in some instances even part of a room, but then these are masters of that part, although they work with and as their own workmen, hire and pay wages as any other manufacturer, without the workpeople employed having any interest in the business. There were many more of these at Bacup than there are now. Some have given it up, while others have succeeded, and either built mills for themselves or rent large premises. There are more of this sort at Rochdale than any other place in my division."

AMERICAN COOKING STOVES ABROAD.

We learn by the *Ironmonger*, a London periodical, that American cooking stoves have been introdnced into that city, and have met with great favor by those who have used and examined them. It states that the patterns of these stoves were imported from America, and they are commended for beauty, comfort, cleanliness, and the saving of fuel. Our cotemporary observes that there is no country in the whole world where fuel is burned so extravagantly as in Great Britain; a circumstance, no doubt, owing partly to the abundance and consequent cheapness of mineral fuel, partly to the prejudice of English people in favor of a large open fire, and lastly, and possibly chiefly, to the fact that certain fashions, both in pattern and material, have got possession of the market, and are difficult to displace by those which are even far superior. Precisely in the same manner as the old school-books, which were in use in the infancy of our fathers, are still printed and employed by the hundreds of thousands, although they are despised by every person having the slightest acquaintance with the science of education, and consequently entirely superseded in all schools conducted on any system in advance of the most miserable routine. It is calculated that, at the lowest possible estimate, at least nine-tenths of the heat produced by the burning of coal in an ordinary grate passes uselessly up the chimney, and is entirely wasted. In other words, so defective are our ranges, that it takes ten pounds of coal to do the work of one. Others, and we fully agree with them, place the loss much higher. This extravagance in the use, or rather in the mis-use, of fuel is almost exclusively British. In the United States, where the coal fields are of infinitely vaster extent than those in Great Britain, much greater economy is practised; particularly in the construction of apparatus for cooking. Many of the American stoves are simple, valuable and ingenious.

STEWART'S IMPROVED APPARATUS FOR CLOSING DOORS.

After all the numerous devices which have been tried for closing doors, it is surprising to find still new ones coming forth for effecting so simple an operation. The one here illustrated is peculiar, and, in many places, will doubtless be found superior to any other.

The lever, A, attached by a fulcrum to the door frame, has its long arm weighted while its short arm is connected with the door by means of a cord which passes down vertically, and is turned by the pulley, *b*,

into a horizontal position, as shown. If the door is opened at right angles with its frame, the lever, A, is raised into a perpendicular position, so that it rests upon its fulcrum, and does not exert any power to close the door, thus allowing the door to remain open. A slight force, however, starts the door from its place of rest, and as the lever descends, its heavy end departs farther and farther from a line perpendicular to its fulcrum, thus drawing the door to its closed position with constantly increasing power, and finally holding it closed with its greatest force.

The patent for this door closer was granted to the inventor, Stephen Stewart, on the 11th of September, 1860, but an interest in it has been assigned to D. G. Chapman, to whom inquiries for further information in relation to it may be addressed, at No. 70 Dillwyn-street, below Noble, between Third and Fourth streets, Philadelphia, Pa.

STEEL SPRINGS.—For the last six months, Messrs. James Jeffries & Sons, the well-known spring manufacturers, of Philadelphia, have adopted a new mode of securing the leaves of their springs together. No hole is made through the leaves, nor is any bolt used. Two notches are made in each edge of the two top and two bottom leaves, these notches being made where they will be covered by the band which, when shrunk on, is indented, by means of a punch, into each notch. The band is thus indented at four points on each side, or at eight places in all, and has so firm a hold upon the leaves that loosening would be impossible. The top and bottom leaves being thus held firmly by the band, the intermediate leaves are held firmly in place by the studs, punched in the ordinary manner, at their ends. The metal taken out of the top and bottom leaves in making the notches is not one half that which would be removed for a bolt hole, while the intermediate leaves are left of the full width and strength. Springs thus secured together can never work loose, and there is no extra part which, like a bolt, can break or come off.

ACTUAL YIELD OF CROPS PER ACRE.

Any one much acquainted with farmers must be aware of their general disposition to overestimate their crops; but we suspect that those most familiar with this trait of human nature will be surprised at the actual yield of the leading staples in the fertile State of Ohio, as shown by the following statistics from the office of the Auditor of the State, which we find in a recent number of the *State Journal*:—

Wheat.—Number of acres sown, 1,790,627; bushels produced, 13,345,844; average per acre, 7½ bushels.

Corn.—Acres sown, 2,339,204; bushels produced, 69,372,343; average per acre, 30 bushels.

Oats.—Acres sown, 644,954; bushels produced, 15,055,059; average per acre, 23½ bushels.

Rye.—Acres sown, 98,011; bushels produced, 561,065; average per acre, 5⅝ bushels.

Barley.—Acres sown, 102,729; bushels produced, 1,639,388; average per acre, 16 bushels.

Buckwheat.—Acres sown, 149,645; bushels produced, 2,222,083; average per acre, 15 bushels.

Meadow.—Acres, 1,340,566; tuns of hay produced, 1,365,888; average per acre, 1 tun.

Wheat Crop.—Smallest average per acre: Trumbull county, ½ bushel; Mahoning, ½ bushel; Columbiana, 1 bushel; Stark, 1 bushel. Largest average per acre: Ottawa county, 17 bushels; Erie, 16 bushels; Sandusky, 16 bushels; Lucas, 16 bushels. Smallest crop in one county: Trumbull, 2,084 bushels; Mahoning, 6,510; Portage, 10,373 bushels; Geauga, 11,078 bushels. Largest crop in one county: Butler, 589,076 bushels; Seneca, 502,500 bushels; Montgomery, 461,214; Highland, 399,005 bushels.

Corn Crop.—Smallest average per acre: Carroll county, 15½ bushels; Geauga, 20½; Stark, 21; Vinton, 22½. Largest average per acre: Lucas county, 42 bushels; Lake, 37; Preble, 38; Butler, 37; Ross, 37; Pickaway, 37; Warren, 37. Smallest crop in one county: Paulding, 127,593 bushels; Geauga, 154,319; Carroll, 211,596; Van Wert, 282,018. Largest crop in one county: Ross, 2,895,097; Pickaway, 2,722,153; Butler, 2,089,463; Franklin, 1,883,209.

Butler county produced the largest crop of barley, 339,935 bushels; Coshocten, the largest crop of rye, 26,541 bushels; Columbiana, the largest crop of buckwheat, 123,233 bushels; Wayne, the largest crop of oats, 529,370 bushels; Trumbull, the larges crop of hay, 47,998 tuns.

AMONG the numerous useful applications of which photography is capable, there is one both novel and amusing which deserves to be recorded. Urgent private affairs detaining a certain prince at Palermo, he could not as usual, pay his annual visit to Paris this summer. But the prince's wardrobe required replenishing, and with a new Neapolitan dynasty came new fashions; the prince was in a state of sartorial despair, till the happy thought occurred to him to be photographed, on the scale of one inch to the foot, and to send the proof to an eminent Parisian *tailleur* The artist took his measures accordingly; the suit was duly made and forwarded to Palermo. The prince, on receipt of his garments, sent a letter to the tailor, in which he proclaims the fit to be admirable. He is delighted, and so is the tailor. The prince sent another photograph representing him in his new suit. It is easy to see that it is a perfect fit.

WATER IN LONDON.—In a careful and elaborate report to the New River Water Company, Professor Spencer, in speaking of the corrosion of iron mains and the effect of gas leakage, states that it is computed that there are 4,000 miles of gas mains laid under the roadways of London, from which 600,000,000 feet of gas are annually absorbed into the earth, the far larger proportion of which could be saved by improved conduits. As a matter of economy, its results would pay a dividend of five per cent on the gross capital of the London companies. It is a question for photographers how far the extraordinary excess of carbureted hydrogen with its other impurities, contaminating their water at times, may account for exceptional and unexplainable phenomena and puzzling failure.

Two telegraph operators can carry on a silent conversation together by making the dots and lines of the Morse alphabet on each other's hands with their fingers.

INTERESTING CORRESPONDENCE.

AN EXPERIMENT WITH GLASS MIL . PANS

MESSRS. EDITORS:—In your valuable paper of Oct. 13th, I notice the following:—

"BUTTER MAKING.—Every improvement which facilitates the making of high quality butter is of deep interest and importance to agriculturists. We do not hesitate, therefore, to point attention to the subject of glass milk pans which have been introduced into this region. Experience has shown their extraordinary value in the dairy, by the saving of labor and the securing of cleanliness and sweetness in the manufacture."

Upon this you remark:—

"We quote the above from an Irish agricultural journal. If we mistake not, glass milk pans have been used to some extent in this country, but with what success we are not advised."

As this subject has now the recommendation of a foreign paper, our farmers will probably be ready to adopt the suggestion. On the 10th of June, 1856, I furnished to the *Ohio Farmer*, published at Cleveland, Ohio, the following communication:—

Editor Ohio Farmer:—It is a common remark that thunder sours milk. This remark, though correct enough for common use, it is well known is not correct in fact. It is not the thunder, but the *electricity* which affects the milk.

To preserve milk, then, pans should be non-conductors. Tin or other material that is a conductor, is usually used, and the effect is that milk (especially in thunder showers) sours before the cream rises.

I have been experimenting a little, and the following is the result:—

I took the milk of the same cow, milked at the same time, and divided it equally, putting half in a glass pan and half in a tin pan, and placed them side by side. In just twenty-four hours were two thunder showers, and at the end of that time the milk in the tin pan was sour—that in the glass pan sweet and good. At the end of twelve hours more, that in the tin pan was thick *clabber* or "*lobbered*," as the Yankees call it, and that in the glass pan *began* to sour. From this I believe glass pans will preserve milk one-third longer than tin pans. Will our dairymen try it?

Well, they did not try it, as it was nothing but an *American* suggestion. As it now comes across the ocean it will probably attract attention. I hope so.

L. V. BIERER.

Akron, Ohio, Oct. 24, 1860.

RUBBER BELTING GETTING SMOOTH.

MESSRS. EDITORS:—In the last number of your valuble journal I notice that one of your friends asks how to remove the glazing from rubber belts.

What in the world does he want to remove the glazed face from them for? A glazed face is just what I want on a rubber belt; you may be sure you have your belt in good working condition if the face polishes up smooth so as to shine. I have been running rubber belts for fourteen years and have now over three thousand feet of all widths, from two feet to two inches, running in the factory with which I am connected, and I always want to see the faces smooth up and become glossy.

There is considerable difference in these belts, even in the same lots, but those do best that polish on the face by use, provided they are at the same time flexible.

I think it is a great mistake to have belts thick; to get power it is much better to add to the width and never strain the belt too hard; then get your pulleys as smooth as possible, a very little swollen in the middle—say one-eighth of an inch to the foot in width. In starting rubber belts, the dust should be brushed off them frequently; if it begins to polish, you may be sure you will have no trouble with it.

Some of my neighbors use double leather belts which are very expensive—very nice they are, to be sure—but for economy and keeping up a uniform speed, give me a rubber belt of liberal width, not too thick, but flexible. I have run such belts from three to five years without altering a lacing, and have now running some which have been in use from seven to ten years. There is another good thing in rubber belts; they keep tight on the edges. I have found it a good plan to lag pulleys with a piece of rubber belt; if fitted on neatly it makes a really good lagging; some of them shine and look handsome.

At Chickering & Sons' great piano factory, which is close by me, they run with rubber belts; their main belt and pulley are as smooth as glass. There is not, in New England, better or neater adjusted machinery than theirs.

B. M. C.

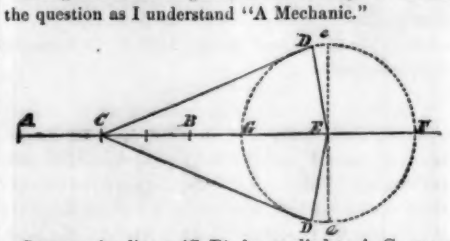
Roxbury, Mass., Oct. 16, 1860.

[In addition to the above, we would state for the information of those who frequently inquire for the address of dealers in belting that the best vulcanized rubber belting known to us is manufactured by the New York Belting and Packing Company, Nos. 37 and 38 Park-row, New York, and by the Boston Belting Company, of Boston.—EDS.

THE CRANK MOTION AGAIN.

MESSRS. EDITORS.—In your issue of September 1st., 1860, there is a demonstration by Professor Byrne of a certain fact respecting "a property of the crank motion," in which the Professor seems to misapprehend the drift of the question by your Cincinnati correspondent.

Using the same diagram, I will attempt to answer the question as I understand "A Mechanic."



Suppose the line x (C D) be applied to A G, or we start with the crank at G. Now carry it forward on the line A F, till D coincides with E, and the line x with C E. It is evident that C will be at the middle point of A B. Now elevate the point D along the perpendicular E e, to the point e; it is equally evident that the other extremity of the line x will approach the center, E, equal to the distance from E to the foot of a perpendicular let fall from the point D on the line A E.

It seems to me that this illustration answers "the reason why." A practical fact connected with it is: the greater the length of C D, the more regular will be the motion of the crank.

W. F. H.

Columbia, Tenn., Sept. 7, 1860.

A SUBTLE QUESTION IN PHILOSOPHY.

MESSRS. EDITORS:—I have noticed in some late numbers of your paper statements that but one-tenth part of the useful effect due to *theoretical* calculation is realized by steam power.

Permit me to ask: Is not one-half of all power—steam or other power—to be deducted from theoretical calculations of what should be the result? Does not this follow from the admitted law that action and re-action are equal? We may say that but one-half the useful effect is realized. This, however, is not the language of an enlarged philosophy. Were all the result of power to be realized in one direction, the result would not be useful but destructive. Chaos would instantly resume its dominion.

AN OLD SUBSCRIBER.

[To our correspondent's question we answer: No. If a cannon is pointed vertically upwards and discharged, though one-half the force of the powder is exerted in driving the ball upward, and the other half in pushing the earth downward, yet the whole power is exerted in increasing the distance between the ball and the earth. In the same way, when a piston rod is pushed out of a cylinder by steam, though one-half of the power of the steam is expended in pressing forward the piston and the other half in pressing back the cylinder, yet the whole power is expended in pressing apart the outer end of the piston rod and the inner end of the cylinder, and it is conceivable that it might all be utilized as dynamic power.—EDS.

PRESERVING IRON WITH ZINC.

MESSRS. EDITORS:—I saw it stated in the SCIENTIFIC AMERICAN for last week, that a Belgian, named Stipheen, had discovered that zinc placed in contact with iron or steel would prevent them from rusting. Now, this has been known to me for some time, and I have by this means kept from the effects of the damp sea fogs, which prevail here, table cutlery, my gun, &c. I made use of zinc in this way in endeavoring to preserve from rust a valuable gun, which neither oils, cases nor india-rubber coverings would protect from the effects of moisture. I did not suppose that there was anything but what was well known to the scientific world in this property of zinc in preserving iron, which is, I presume, owing to electricity.

My gun has also led me to prepare an oil which, as a lubricator and preservative from rust, excels anything I have ever used.

I expose some of the best refined coal oil to a considerable cold and use the more liquid part which rises to the top, mix with a very little refined castor oil, then some unslacked lime, and, after being shaken well and submitted to a slight degree of heat, filter it.

There are a number of little contrivances and preparations which I have made which I never supposed were of sufficient importance to be called inventions or discoveries, but if there is anything patentable in them, I should be mightily pleased to see my name on the list of inventors which appears weekly in the SCIENTIFIC AMERICAN.

T. DANIELS.

Staten Island, Oct. 15, 1860.

RAISING SUNKEN SHIPS.

MESSRS. EDITORS.—In No. 12 of the present volume of your valuable paper, in the column of "Notes and Queries," you speak about the means employed by an American company for raising vessels in the port of Sevastopol. These means appear to me to be insufficient, and I call your attention to a patent which I obtained through your valuable services, on a vessel, which I think will produce the desired effect, especially when used in connection with the diving bell of Dr. Payerne, which I am authorized to use. My vessel can sustain a much larger weight than an ordinary vessel, on account of its being full and fastened by chains, and its side screws and air tube will give it a very great effect.

With one of my vessels and two diving bells, every sunken vessel could be raised without the aid of tarpaulins and pump.

F. S. PRONNIER.

85 Greenwich-street, New York.

A WISE SUGGESTION.

MESSRS. EDITORS:—In your last number (Oct. 6th) you state that you think seriously of introducing the French measures—metre and gramme—into your paper. Permit me, as a "constant reader," to suggest that as your journal is intended not only for the man of science but also for the mechanic and manufacturer, who are not always familiar with that standard of measure, it would be more agreeable and acceptable to your readers in general to give in each case both the French measure and its equivalent in the United States standard. Such a course would add but a trifle to the length of an article, would inconvenience nobody, and would do more than anything else could to familiarize our practical men with that truly scientific system.

MARSHALL S. BIDWELL, JR.

Monterey, Mass., Oct. 9, 1860.

[If we introduce the use of French measures, we shall certainly adopt this advice.—EDS.

MORE LETTERS FROM INVENTORS.

We know that mechanics and manufacturers, in common with all other trades people, like to read letters from persons engaged in the same business in other sections of the country. We believe that inventors and patentees are also interested in hearing from their brother inventors, and this is our apology for presenting the annexed letters.

MESSRS. MUNN & CO.—About three years ago, you secured a patent for me, made an engraving, and published a description of it. I have followed your suggestions as to the sale of rights, and have made a good property by it.

H. F. STANARD.

Wayne, Mich., Oct. 17, 1860.

MESSRS. MUNN & CO.—I received my deed a few days since from the Patent Office, for my invention of a cotton stalk puller, &c., procured for me by you. I am very thankful to you for your promptness in prosecuting my business, and I shall spare no opportunity to recommend you to others. Since I received my deed, I have had several solicitations from solicitors for any business I might have in future, but must decline their kind offers, as I think I can see that you possess superior advantages in this line of business, consequently you shall have my business and influence.

HENRY SNYDER.

Dayton, Ohio, Oct. 22, 1860.

MESSRS. MUNN & CO.—I am happy to inform you that I received my patent on the 13th. I am highly gratified,

and return my sincere thanks to you for your punctuality and off-hand way of doing business, and shall use my utmost endeavors to recommend my friends to you in the patent business. CHAS. SNYDER.

Hawley, Pa., Oct. 16, 1860.

MESSRS. MUNN & CO.—Please accept my thanks for the able way in which you have conducted my late case in the Patent Office. From the information I received six weeks since, I thought it almost impossible to secure a patent on my seeding machine; then imagine my surprise when, a few days since, your letter arrived, announcing the glad tidings of your success in obtaining a decision in my favor. My patent came to hand yesterday, and instead of three claims, as I had expected, I find you have secured seven. WM. M. GAREE.

Granville, Ohio, Oct. 17, 1860.

MESSRS. MUNN & CO.—I last evening received your announcement that my Letters Patent had been ordered to issue, and I hereby tender you my sincere thanks for the fidelity, promptness and honesty with which you have conducted my case, and rest assured that my influence shall always be thrown for you should any of my friends have occasion to employ patent agents for any purpose whatever. My influence shall also be thrown in favor of your excellent paper, the SCIENTIFIC AMERICAN. C. GLOYD.

Wynant, Ohio, Oct. 13, 1860.

MESSRS. MUNN & CO.—I have just received my Letters Patent and feel somewhat elated with my good fortune. I feel myself under lasting obligations to you for the efficient manner in which you have conducted my case, and will ever feel it my duty to recommend you to others. JOHN FORMAN.

Grafton, Va., Oct. 16, 1860.

MESSRS. MUNN & CO.—By this day's mail I have received Letters Patent for my straw cutter, and return you my thanks for your kind and prompt attention. I assure you nothing shall be wanting on my part to extend your agency and the wide spread of your noble journal, when viewing the different improvements of the day and seeing the vast interest you take in all those useful improvements by which mother earth is made to yield up her treasures. J. H. LILLY.

Bardstown, Ky., Oct. 19, 1860.

MESSRS. MUNN & CO.—This is to inform you that I have received my Letters Patent for an improvement in rotary harrows, for which you will please to accept my sincere thanks and best wishes for the valuable services which you have rendered to me. My patent papers are the neatest and best gotten-up of anything of the kind I have ever seen; the drawing is so plain that it hardly needs a description. C. WATSON.

Cascade, Va., Oct. 16, 1860.

MESSRS. MUNN & CO.—I return my sincere thanks for the promptness which you have used in putting through the application for Letters Patent on my shovel cultivator. The deeds have just arrived. I was surprised to find they cover more than I expected or even hoped for, and I shall take pleasure in recommending your invaluable agency to inventors. You will receive another plow from one of my neighbors in a few days.

ALLEN HUGHS.

Gratiot, Ohio,

MESSRS. MUNN & CO.—I have just received my new air-engine patent from the Office, and beg you to accept my cordial acknowledgements for the efficient manner in which you have conducted my application.

J. ERICSSON.

New York, Oct. 10, 1860.

MESSRS. MUNN & CO.—My Letters Patent, through your Agency, have come to hand. You will please accept my warmest thanks for your perseverance and disinterestedness in my behalf, in getting those Letters Patent for my system of school desks. The high reputation of your Agency in securing Letters Patent has been fully sustained in the successful termination of my own case. S. L. WILKINSON.

Cross Plains, Tenn., Oct. 1, 1860.

RECENT AMERICAN INVENTIONS.

The following inventions are among the most useful improvements patented this week. For the claims to these inventions, the reader is referred to the official list on another page:—

ROLLER COTTON GIN.

The object of this invention is to increase the working capacity of the roller cotton gin, a machine which has not yet been surpassed nor even equaled by any other gin hitherto devised, so far as the producing of perfect work is concerned. The objection, however, to the roller gin is the extreme slowness of its operation, and this objection has caused the saw gin to be used in ginning short-staple cotton, but at the expense, however, of considerable injury to the staple—the roller gin being confined to the long-staple cotton. This improvement consists in the use of a series of rollers arranged with an apron, stripper and fan, and screen, whereby both long and short-staple cotton may be effectually and rapidly separated from its seed, without the least injury to the staple. The inventor of this gin is N. A. Patterson, of Kingston, Tenn.

PLATE PRINTING.

This invention relates to an improvement in printing from engraved plates, or those which have the design, figure, pattern, or lettering to be printed sunk, in their surface, and which have hitherto required the paper or other substance which is to receive the impression to be pressed into the recesses or sunken portions of the plate, the recesses or sunken portions being filled with ink and the raised portions wiped perfectly clean. This kind of printing (commonly called "copper-plate printing") is, compared with the operation of a typographical press, very slow and tedious work. In the former process, the plate requires to be covered or smeared over entirely with ink in order to fill the sunken portions, and the surplus ink must then be wiped off and the surface of the plate left perfectly clean, in order that the sheet which is to receive the impression be not soiled. In the latter process, the design being a raised surface, no wiping and but little manipulation are required. The object of this invention is to expedite the process of plate printing, and at the same time perform equally as good work as by the old process. To this end, there is employed an ink of a fluid nature which is injected into the recesses or sunken portions of the plate from underneath the latter, and through proper perforations therein; the ink being injected into the plate with sufficient force, and while the paper or other substance to receive the impression is being pressed upon its face side, to leave an impression on the paper corresponding to the configuration formed by the sunken portions of the plate; the ink being drawn from the recesses of the plate as soon as an impression has been given, in order to admit of the adjustment of a succeeding sheet and a repetition of the operation. W. H. Oakes, of this city, is the inventor of this system of printing.

NEW COMPOUNDS OF LEAD.

The object of this invention is to produce chloride of lead or other compound of lead, such as the oxychloride of lead, the binoxyd of lead, the nitrate of lead, the carbonate of lead, the chromate of lead, &c., in a simple and cheap manner from the sulphate of lead, or to produce the last-named compounds from chloride of lead which may have been prepared in any other already known manner. To effect this purpose, sulphate of lead or chloride of lead is treated with chloride of sodium or chloride of calcium, or with the chloride of any other alkali metal or alkaline earthy metal, and by precipitating with salts of chromic acid or by treating with chlorinated alkalies or alkaline earths free from carbonic acid, or, in short, by treating with such chemical agents which do not precipitate at the same time any of the impurities contained in the solution, the desired compound is produced. The credit of this invention is due to F. F. Mayer, No. 36 Beekman-street, this city, who obtained patents for the same in this country and in Europe, through the Scientific American Patent Agency.

Several exchanges state that a cave has been discovered in Alachua county, Florida, which is described as larger than the Mammoth cave of Kentucky, and as having an ancient Latin inscription on the walls, which states that a party of Danes had visited this cave in the year 1050, and that a priest who accompanied them had left this memorial of their visit.

A COLUMN OF VARIETIES.

Several beds of pottery and fire-brick clay have recently been discovered near Red Bank, N. J.

Statistics go to prove that tea is used more or less as a beverage by one-half of the human race—500,000,000 of people. Theine is the peculiar organic principle which gives tea its value. Taken in small quantities, tea is healthful; but the extract of one ounce taken per day, by one person, produces trembling of the limbs and wandering of the mind.

In the fourteenth and fifteenth centuries, England imported iron and steel from Germany and Spain. It now supplies both of these countries with great quantities of these metals. This revolution in manufactures and trade was brought about by new inventions. In 1740 about 17,358 tuns of iron were made in Great Britain; in 1858, 8,040,959 tuns.

Shell lime is very superior to stone lime for agricultural purposes, as it contains considerable phosphorus. Wherever it can be obtained, it should always be preferred by farmers.

Cotton is now being carried by rail from the Mississippi to the eastern States. The Illinois Central Railroad recently concluded a contract to convey 2,000 bales of cotton from Cairo to Chicago, from whence it is to be forwarded to New England.

A rifled cannon, said to be the largest in the world, was recently tried at Shoeburyness, England. It weighs 6 tuns and fires 174 lb. shot. It is made of puddled steel, and is the greatest mass of this material ever put together.

The St. Louis (Mo.) *Democrat* states that a total of 80,000 buffalo robes have been received in that city during the present year. These robes are all tanned by the Indian squaws; their lords of creation do not stoop to such works of art—they do the hunting. We understand that, owing to the last winter being so warm, no less than 50,000 robes were left on the hands of dealers.

An experimental line of horse-railroad is being laid down in London, on the plan of our countryman, G. F. Train, who has so successfully introduced this system of city conveyance into Birkenhead and Liverpool.

The London *Mechanics' Magazine* states that rails, 27 feet in length and 82 lbs. to the yard, are being made at the Darlington Iron Works, and are the largest which have yet been rolled. Railroad companies discover that, by having strong rails and heavier engines, large trains are worked with less labor, greater dispatch, and at a smaller cost than when lighter stock is used—one train doing the amount of carriage work that three usually perform.

There are 381 gas companies in the United States: in Great Britain there are 1,100. The lower the cost at which gas can be furnished, the greater will be its consumption, and the greater the profit to the companies. The price of gas in most of our cities should be greatly reduced.

The western railroads are doing an immense business this Fall, and if the coming winter is not very severe, more freight will be transported on them than during any previous winter whatever.

A very good sign of railroad prosperity is the activity displayed in some of the locomotive building establishments. At Baldwin & Co.'s, of Philadelphia, 60 engines are at present on order.

At the Imperial print-works, Vienna, there are 10 presses, into which the paper is fed in webs from the rolls as they come from the paper mill. The sheets are cut off in lengths as they enter the presses, and when they are fed in to print on the opposite sides, it is done in the usual manner.

With machinery, they are now drilling through the hardest granite, at the rate of one inch per minute, in the Hoosac tunnel. This is ten times as rapid as it can be executed by hand.

A huge piece of iron work was recently forged in Glasgow. This was a stern post and part of the keel for one of the new iron steamships of war termed "rams." The stern post was forged apart from the keel piece, then the two were welded together, the whole weighing 30 tuns in one united piece. Forty horses were employed to remove it from the foundry to the vessel. A powerful steam locomotive for common roads would have been preferable for drawing it.

IMPROVED COTTON CLEANER.

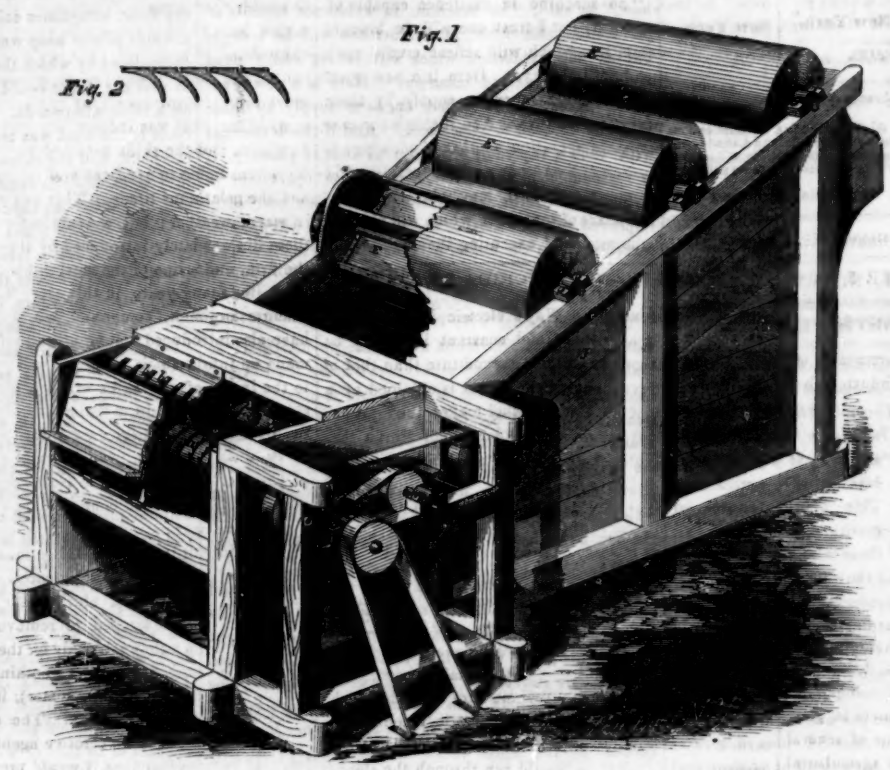
The invention here illustrated consists in one of those slight modifications in an important machine which are frequently of great value. Before cotton is in a suitable state for market, it must be cleaned from sand and dirt, as well as from seed, and the amount of cotton annually produced is so large that the machinery for effecting this operation has attracted a great deal of attention. The cotton cleaner represented in the annexed cut is very simple in its construction, and will be readily understood.

A revolving cylinder, *a* (Fig. 1), carries a series of saws which project in part of their circumference through the eccentric slits, *b b*, and the cotton, being placed above these slits, is drawn through by the hooked teeth of the saws. A cylindrical brush, *c*, revolving in a direction opposite to that of the saws, and at a higher velocity, brushes off the cotton from the saws and blows it up the inclined trough, *d*. The bottom of this trough is formed of a series of curved slats of the shape represented in Fig. 2, the slits between them being narrow at the top and expanding below, as shown, so that the sand and dirt which falls upon the bottom of the trough may drop through freely without choking the openings. A series of beaters, E E E, so belted or geared that each one may revolve more rapidly than the one next below, drive, blow and beat the cotton upward through the trough, dashing it against the slatted bottom, and knocking the sand and dirt out of it. As the openings between the slats are curved backward and downward, while the motion of the cotton is upward and forward, there is no disposition in the cotton to again mix with the sand from which it has once been separated, but the sand falls through the slats into the air-tight receptacles below, while the cotton passes out of the end of the trough in a light and perfectly clean condition.

The patent for this invention was procured (through the Scientific American Patent Agency) on the 2d of October, 1860; and further information in relation to it may be obtained by addressing the inventor, William H. Johnson, at Albany, Ga.

Fig. 1

Fig. 2

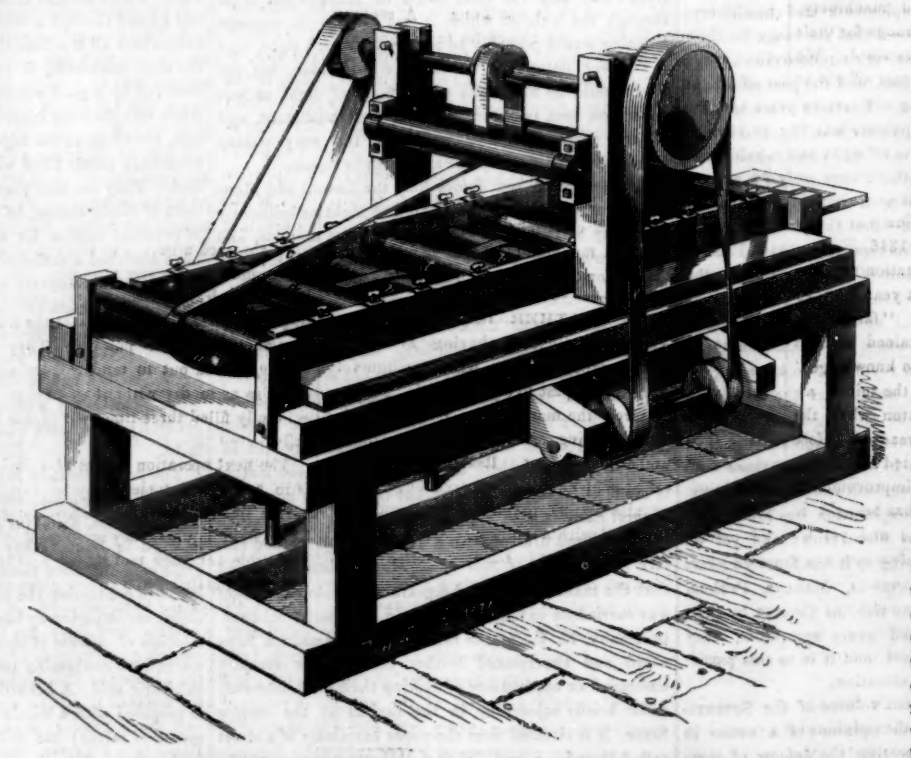


JOHNSON'S IMPROVED COTTON CLEANER.

LAMPBLACK AND OIL THE CAUSE OF FIRE.—An English manufacturer states that one of his workmen placed a ladle, which had been recently used for the purpose of measuring linseed oil, upon the top of a cask of lampblack, and a few drops of the oil fell into the cask. One evening, just before closing the works, he discovered a very disagreeable smell and searched the factory to ascertain the cause, and, to his surprise, found the whole of the black in the cask resemble a large ball of fire, and there is no doubt that before morning it would have burst into a flame, and caused not only the destruction of the stock, but of the entire premises. My plan has been (says the above manufacturer), since the occurrence, not to keep more black in stock than is required for present use. Wood or canvas painted with lampblack and oil ought to be carefully looked to, at least until well seasoned.

IMPROVED SAND-PAPERING MACHINE.

Most woodwork requiring a smooth surface, after it has been passed through the revolving planer, is first smoothed with a hand plane and then finished by being rubbed with sandpaper. The large amount of labor involved in this smoothing by hand was found to be so expensive by Messrs. Dean & Munger, of New Haven, Conn., extensive manufacturers of wooden slates, that one of the firm—Mr. George Munger—was stimulated to devise a machine by means of which the operation could be performed either by steam or water-power. The machine invented and patented has proved entirely successful. The stuff is taken directly from the power plane, and finished in the most perfect and satisfactory manner in the machine illustrated by the accompanying engraving.



MUNGER'S IMPROVED SAND-PAPERING MACHINE.

It is, we think, as well adapted for smoothing sash, doors, and other woodwork, as for wooden slates and their frames, for which it is so extensively used, and the owners of the patent have decided to offer it for sale to be used for such purposes. The annexed engraving illustrates the machine in the plainest possible manner.

The sandpaper, cut into round sheets, is pasted upon the top of a series of flat circular disks, *a*, and these disks being put in rapid revolution, the stuff to be smoothed is passed over them, being pressed down and fed along by the horizontal rollers, *b b b b*. These rollers are carried by a belt, *c*, which is pressed down against them by the rollers, *d d d*. The bearings of the rollers, *b b b b*, are in boxes which are secured in vertical grooves, so that their distance above the sandpaper may be varied to suit stuff of different thicknesses. The disk with which the stuff first comes in contact in its passage through the machine is covered with coarse sandpaper, and the disks which it successively encounters are covered with paper of increasing fineness, so that when it leaves the machine it is very smoothly finished.

The patent for this invention, which was granted (through the Scientific American Patent Agency) on April 17, 1860, has been assigned to Messrs. Dean & Munger, of New Haven, Conn., who may be addressed for further information in relation to the matter.

SEARCH AFTER A LOST INVENTION.—We sometime since alluded to the fact that the grave of the Marquis of Worcester was about to be opened for the purpose of discovering the original model of a steam engine invented by him. Through the researches of the indefatigable Mr. Bennet Woodcroft, of the London Patent Office, proof was obtained that the Earl of Worcester desired in his will that this model should be interred with him, and actually in his coffin. Mr. Woodcroft is now waiting to receive authority from the Duke of Beaufort to open the old family vault and examine the coffin of the deceased noble inventor. In all likelihood, the old model will now be a handful of dust when found, as it was no doubt composed principally of wood. The records left us of this steam engine impart the information that it raised water direct by the force of a steam jet.

Scientific American.

MUNN & COMPANY, Editors and Proprietors

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VOL. III., No. 19....[NEW SERIES.]....*Sixteenth Year.*

NEW YORK, SATURDAY, NOVEMBER 3, 1860.

AGRICULTURAL IMPROVEMENTS.

EVERY department of American industry has been greatly improved within a very few years, and this is especially the case with agriculture. This affords cause for gratitude, because all those who are engaged in the professions, commerce and the common arts are dependent upon the surplus products of agriculture for sustenance. The present year has been unexampled in productiveness; the fields have yielded abundant harvests, and the orchards have been bowed down with heavy loads of golden fruit. "These blessings," as one said to us recently, "have put our farmers in good heart," and we judge from the cheerful tone of several discussions which have lately been held at agricultural society gatherings, that prosperity is acting as a wise stimulant to further enterprising action. With the great amount of intelligence which is now widely disseminated on agricultural subjects, old defects and new wants are becoming more generally known. This may surprise many persons who have imagined that the field for agricultural inventions was almost fenced in. Owing to the great number of patents which have been issued of late years for farmers' implements and machinery, many inventors have considered that the range for their efforts in this department was very circumscribed. We assure them such is not the fact, and the past affords us good grounds for this opinion. Fourteen years ago, the yearly issue of agricultural patents was 78; in 1859, it was 664, which is an increase of eight and a half times in these few years. When there were only 78 patents granted in one year, many persons thought that the end of improvements had arrived—that the plow had surely attained to perfection. In his report for 1846, Examiner Dr. Page indulges in a sort of lamentation over the paucity of agricultural inventions for that year, and he concludes with the mournful apothegm, "farming is up-hill work." Perfection cannot be attained without severe toil, and "there is no royal road to knowledge." Farming may be "up-hill work," but the toil of ascending the mountain peak is all forgetten when the summit is gained and the world seems spread out before our vision. Similar results have animated those who have devoted themselves to agricultural improvements. No field for the inventor's exploration has brought so many rich rewards for new discoveries; and yet we think it is just about as inviting as it was fourteen years ago. Although the McCormicks, Mannys, Peelers, Pitts and others have become rich as Crœsus by their patent harvesters, plows and grain separators, they have not exhausted the subject, and it is to this particular point we wish to direct attention.

On page 266 of the present volume of the SCIENTIFIC AMERICAN, we quoted the opinions of a writer in the New York *World*, respecting the defects of common plows and the benefits which would result from an entire revolution in the mode of preparing the soil for planting. A machine which would dig up and thoroughly pulverize the soil was recommended as a superior substitute for the common plows, which merely turn it over in furrows. This subject was also brought up at the meeting of the Farmers' Club, held in this city on the 22d ult., at which the secretary stated that, as there was to be another World's Fair in London in 1862, he "hoped some ingenious American citizen would invent a practical tilling machine which would rapidly pulverize the soil and put it in good condition for planting, and present it at the international exhibition." "There is now," he said, "no machine in existence capable of performing this labor, but I trust one will be brought out at the exhibition which will reflect credit upon American genius and industry." Here is a new want which inventors are called upon to supply by those specially devoted to agriculture. And if this is the case with such a venerable operation as that of plowing, it is reasonable to infer that many other operations in farming, as commonly practised, may also be greatly improved by a new class of machines, which will produce a revolution in the modes of executing them.

LIGHTING MANUFACTORIES BY WATER POWER.

The experiments with Way's electric light have demonstrated that a brilliant and constant light may be maintained without any other expenditure than that of mechanical power; but if the power is obtained by a steam engine, the cost of the fuel makes the light expensive. As our cotton and woolen manufactories that are driven by water power, almost all have a surplus of power in the winter months, the only season during which they are lighted, would not the owners find this the best and cheapest plan for lighting their establishments?

An hour glass, containing a supply of mercury, would be placed in the middle of each room, just under the ceiling, and insulated wires, passing perfectly air-tight through the glass, would lead to a magneto-electric machine in any convenient part of the establishment. The wires would connect with the mercury in each end of the glass, and when the magneto-electric machine was turned by the water wheel, the current of electricity passing along the wires, would run through the slender stream of mercury flowing down from the upper chamber of the hour glass to the lower, the light being given out by the electric current as it darted from drop to drop of the mercurial stream. When the mercury had nearly all run down from the upper bulb of the glass to the lower, it would be necessary to turn the glass over, for which purpose it might be connected to simple clockwork, and the wires would be brought out of it through the axle on which it was hung. A separate machine would probably be required for each light, and the power demanded would be considerable, but the room would be filled with such a flood of light as was never yet seen in a manufacturing establishment, and all the current expense would be the very trifling outlay required to keep the apparatus in repair.

We expect to see before long the Lowell and Manchester manufactories illuminated at night as brilliantly as by day by the use of electricity in some manner, and most probably by the magneto-electrical machine and mercury light of Professor Way.

MOROCCO LEATHER DRESSING.

Although enameled oilcloth, having its surface finished to imitate morocco leather, has come into very extensive use during the past five years, still it does not seem to have injured the manufacture of the genuine article. Morocco dressing establishments are still increasing in number and extent. Real morocco leather is made of tanned goatskin; but the term is now, in a general manner, also applied to tanned sheepskin, which is colored and dressed with a polished and corded surface in imitation of morocco. Having been informed that the manufacture of sheepskin into colored leather was carried on extensively, and in a superior manner, in Albany, N. Y., by the firm of A. Williamson & Sons—old and experienced leather dressers—we recently embraced an opportunity of visiting their establishment, while briefly sojourning in the capital of the empire State. It is situated near the upper extremity of a street called Broadway, and although this street is very unlike its great namesake in New York, it can boast of a good morocco factory, in which some new and improved processes are carried on. Colored sheepskin is principally used for shoe bindings, and, in this establishment, the majority of the pelts are obtained green from sheep and lambs slaughtered in the vicinity. About 100,000 skins are dressed annually in it, and from these about half a million pounds of wool are obtained and sold.

The first process through which they are made to pass is that of soaking and softening by water, to fit them for receiving the unhairing preparation. Formerly hydrate of lime was sprinkled in the inside of each pelt; it was then folded over with the wool side out and laid down on the floor, sometimes called "the pit." In this manner a whole pile or heap was made, and a heating action was engendered by which the roots of the wool were loosened, so that the fleece could be easily pulled or scraped off on a table afterwards. This method of loosening the roots of the wool was tedious, occupying several days to complete, and the skins required constant watching, as they were liable to overheat and injury both to the wool and the gelatinous tissue. This was especially the case in warm weather; but a remedy for this trouble and these ills was lately introduced by the senior member of the firm, and is one of the most important improvements made, for many years, in this art. This is effected by a calcium orpiment compound, which they import and have also introduced among other manufacturers. It is made up into a thick creamy consistency, then applied to the inside of the skins which are folded over, wool side out, and laid in a heap, as before described. In twenty-four hours afterwards the skins can be deprived of their wool, and if they have to lie longer, no injury will result. In all cases the depilatory action is certain without injury to wool or skin tissue.

The next operation is that of washing the skins prior to unwooling them. This latter manipulation is executed by placing them upon an inclined bench, and rubbing off the wool with a blunt tool. The flesh side of the skins is also scraped to remove slime and loose flesh, after which they are ready for the liming operation. They are now placed in vats containing milk of lime (slacked lime mixed with water), in which they are treated for about two weeks. The office of the lime appears to be that of a corrosive agent for the removal of grease in the skins, as it would prevent the action of the tannic acid afterwards. The lime does not act upon the gelatinous tissue, which alone forms the leather when combined with a tanning agent. A new discovery to shorten and cheapen this part of the process would be invaluable.

The next operation consists in passing the skins through a bath of hen or pigeon manure, mixed with water, which softens them. After this they are washed and passed through a sour of dilute sulphuric acid, which neutralizes all the lime that may remain in the pores of the skin, converting it into a sulphate, which is easily removed by a good washing in moderately warm water. After this they are dipped into a solution of common salt, sewed up at the edges with the grain side out, to form bags partly filled with tanning liquor, inflated and tied. They are now placed in a tub containing an extract of Sicily sumac, in which they float and are kept in constant motion for several hours; and when they have absorbed a sufficient amount of the tannic acid in the sumac to convert the skin into leather, they are taken out, drained and rinsed; and if not to be colored, they are ripped out and dried in the atmosphere in sheds constructed for the purpose. They are stretched on boards, rubbed out to render them smooth, and tacked down so as to dry without wrinkling. These skins are generally filled three times with fresh liquor to tan them fully.

The next operation is that of coloring. If the color is to be applied topically by putting it on the surface with a sponge, the skins are first dried. If they are to be dyed in liquors, they are sewed so as to have the grain side out, then mordanted, and afterwards handled in a tub containing the coloring agents. Prussian blue colors are imparted by handling the skins first in a dilute solution of nitrate of iron for about an hour, then in a warm bath containing the cyanide of potash and a little sulphuric acid. A beautiful blue is thus dyed. A scarlet is prepared with a mordant of the muriate of tin and cream of tartar; the red color is afterwards obtained by handling them in an extract liquor of cochineal. Purple is dyed by applying a cochineal color on the top of a Prussian blue. Bronze is obtained from a strong extract of logwood and alum. After being dyed, the skins are rinsed, stretched on boards, rubbed smoothly down, tacked around their edges and dried.

Topical applications of color are given to the grain surfaces in many instances. They simply consist of a strong extract applied with a sponge or a piece of cotton

cloth; almost any color can thus be put on. A scarlet color is made by a topical application of an extract of turmeric upon a dyed cochineal red. To enable some of the coloring agents to go on evenly, milk and the white of eggs are frequently mixed with them. These applications also serve to impart a metallic luster to the surface. Prior to rolling, the dyed skins are slightly shaved on the wrong side and trimmed at the edges.

The subsequent finishing operations consist in rolling the skins on a table under a small weighted roller having a grooved face, and which is attached to a suspended arm which the operator moves back and forth until the roller has traversed the entire surface. This operation imparts a glossy cordovan surface to the leather. A second rolling, with the grooves running in an angular direction, gives the surface a diamond corded finish—the true morocco style. Formerly these skins were all finished by hand labor. The operatives stretched them on inclined boards, and rubbed over their surface with grooved balls of ebony held in the hand. Sometimes an extra finish is still imparted in this manner to skins.

In this factory we saw the first aniline (popularly called Magenta) colors on morocco that have been applied in this country. The senior partner had been on a European tour last summer, and obtained the new color from abroad. It produces the most beautiful shades of purple, lavender and lilac upon leather. No coloring agent hitherto known can equal it.

All processes for making leather from skins is not tanning, although most persons so term them. White leather is prepared with alum, and in some instances with a paste of flour. These are tawing, not tanning processes. It requires an agent, such as hemlock, oak or sumac, containing tannic acid, brought into contact with gelatinous tissue, to constitute the tanning process.

Heavy sheepskins are frequently split by machinery, and for some purposes such leather is more suitable than any other kind. In this factory, a new machine for splitting had just arrived from England, and we were surprised to learn that, although it did not split so many skins in the same space of time as the American splitting machines, it was preferred because its work was of a superior quality. The cutting knife moves with a reciprocating sawing action, and is driven with a very high velocity.

We have in this brief description of morocco dressing mentioned three new improvements not to be found in works published on the subject, viz.: the depilatory process, the cleansing operations with dilute sulphuric acid, and the new styles of colors. Morocco leather dressing proper is principally carried on in our cities on the seaboard or in their immediate vicinity, as the goat skins are all imported from India, Africa, &c., and the sumac for tanning them from the island of Sicily—that land to which the eyes of the whole civilized world have recently been directed, on account of the wonderful exploits of Garibaldi and his heroic followers, fighting for the freedom of Italy.

WEAR OF RAILWAY CAR WHEELS.—An examination made last year, on the Reading Railroad, in England, showed that, of all the wheels in use on all descriptions of cars since 1852, the average wear had been that of 58,094 miles, before the wheels were renewed. The life of the wheels under the passenger cars was ascertained to be 117,706 miles, a fact which shows not only the superiority of the wheels used under passenger cars, as compared with those under freight and coal cars, but also the advantage of good springs, those under the passenger cars being much the easiest on the road. The coal trains have been run at from 8 to 15 miles an hour; the passenger trains at from 25 to 40 miles. These results, as to wear, were carefully ascertained, and are of value to other railroad companies.

CALIFORNIA MECHANICS.—We learn from our California cotemporaries that the Fair of the Mechanics' Institute held in San Francisco in the month of September last was an entire success. The *California Farmer* says respecting it:—"We say that the mechanics of California have reason to be proud of the exhibition they have made of their skill and progress, and every observer should also be proud that our State can show such enterprising and skillful operators."

THOMAS T. STRODE.—The address of Mr. Strode is Mortonville, Pa.

DISCOVERIES AND INVENTIONS ABROAD.

Trussing Casks.—In trussing casks, coopers generally make a fire of shavings inside of them, for the purpose of slightly warming the staves and thus enabling them to be driven up more easily. A patent has been taken out in England by Thomas S. Cressy, of Burton-on-Trent, for a heating furnace for casks. This furnace is secured between jointed levers and raised up in the inside of the casks, and also lowered, with the greatest facility, to supersede the trouble of making a new fire of shavings for each cask to be trussed. This improvement deserves the attention of all coopers.

Transferring Pictures to Glass.—A patent has been granted to Willoughby Smith, of Dalston, England, for the following process relating to transferring prints. He takes the print of any picture produced on paper and treats its surface with three coats of collodion. When this is set and hard, the paper is washed off, when the ink or color will be found firmly attached to the film of collodion. To effect this operation perfectly, the print should be first stretched on a board and receive the coats of collodion, then put into water to soften it, when it may be easily rubbed off, leaving the design firmly fixed upon a transparent coat of collodion, which is then allowed to dry and afterwards receives a thin coat of transparent varnish. Collodion may be rendered tough and transparent by adding about three per cent of castor oil and the same amount of Canadian balsam to it and boling them together in a close vessel until they are thoroughly incorporated. The printed film of collodion is now ready for mounting upon glass. This is done by placing it between two plates, pressing them close together, and cementing their edges by pasting a strip of paper around them. By this process any printed pictures may be transferred, rendered transparent, and fitted for the slides of magic lanterns. These collodion transfer pictures may also be pasted on single strips of glass and covered on the back with transparent varnish, and in this manner ornamented windows may be easily made by almost any person.

Hardening Spindle Caps.—In spinning and doubling machinery, the spindle cap consists of a cylinder of cast iron, polished on the outside and placed on the spindle. Being made of cast iron the caps are easily damaged by a blow or by falling on the floor. To remedy this defect and render them more enduring, W. Smith and P. Smith, of Keighley, England, have taken out a patent for hardening them in the same manner that steel tools are treated; that is, they heat them to a red heat, then dip them in a bath of cold salt brine.

Deep Sea Telegraphs.—In a communication to the London *Mechanics' Magazine*, Thomas Allan, Esq., a distinguished electrician, states that of 12,000 miles of submarine cable which have been laid in various parts of the world, only 1,200 miles are in working order, at present. He asserts that the success of any ocean telegraph depends entirely on the nature and construction of the cable, and that those companies (such as the Atlantic, of famous memory) which have failed have themselves to blame, because they persisted in dogged adherence to the use of cables which were suited only for shallow waters. An ocean cable, he says, should have great internal strength and low specific gravity—lightness—and it should be made of such materials as will permit it to be thorougly tested before it is laid down. There were upwards of 1,500 joinings in the Atlantic cable, and it never was tested under water until the cable reached the bottom of the sea.

Cast Iron Enameled Water Pipes.—The pipes which are employed to convey water in cities are made of cast iron and are very liable to rapid corrosion, when placed in the vicinity of leaky gas pipes. To obviate this evil, cast iron pipes for conveying water are now being made with imperishable surfaces, by Messrs. Salt, of Birmingham. Cast iron pipes thus treated will be more expensive at first, but cheap in the end, as they will last for a hundred years, whereas, in many situations, common cast iron water pipes have to be renewed every seven years.

The Sun: Is it a Sphere of Fire?—M. Leverrier, of Paris, believes that the spots seen on the sun's disk are clouds in its atmosphere. His opinion is that the sun is not a luminous body on account of its high temperature, but that it is a huge solid or liquid body surrounded by an atmosphere. A common opinion respecting the constitution of the sun is that it has a luminous atmosphere but an opaque body, and that the spots seen on the sun are open spaces formed by unknown causes in the luminous atmosphere. This subject is still shrouded in mystery, and on this very account it excites more general interest.

Earthquakes.—Within the memory of man, earthquakes have been principally confined to a few localities, such as Aleppo, in Turkey, Portugal and Calabria, in Europe, and Chili, in South America. Most of the people in Europe and we, dwellers in North America, have congratulated ourselves that there was no danger to us of such trepidations of the earth producing like sensations in our sensitive hearts. According to Dr. Ansted, of London, however, we are admonished not to be quite so secure in our reflections of immunity from earthquakes, and the quake which vibrated through New England and Canada, last week, affords him argument for his opinions. He tells the people of London, in the *Chemical News*, that "earthquakes have frightened our forefathers, and may overwhelm us. The fatal explosion may happen this or next year; it may not happen in this century. It may originate beneath our very feet, or at the bottom of the ocean near our shores, or it may take place so far away that we hear only the faint distant echoes of the convulsive throe, but we are not the less certainly living over a mine ready to be sprung, and no one can tell when or where the fatal match will be applied."

WOODEN SCHOOL SLATES.—Since the manufacture of wooden nutmegs, in the State of Connecticut, has ceased, the people have turned their attention to the manufacture of all sorts of Yankee notions, from patent sewing birds, in the manufacture of which a fortune has been made, and wooden clocks, in which fortunes have been made and lost, down to campaign medals, of which one manufacturer turns out ten thousand per diem. About the last invention contrived by one of these ingenious people is the manufacture of school slates out of wood. Not long ago, Messrs. Dean and Munger, of New Haven, Conn., took out a patent, through this office, for the manufacture of this article, and from their manifest superiority over the old stone slate, they are going into almost universal use. They are made of three thicknesses of veneering glued together and covered on both sides with a black coating of just the proper degree of roughness to receive the impression from the pencil, and are then framed in the usual manner. Their most striking peculiarities are their extreme lightness and durability; they may be thrown down and even stamped upon without being broken. The manner of polishing these slates is illustrated on another page. The same firm also make blackboards with the same covering.

THE OIL REGION OF PENNSYLVANIA.—A correspondent of the Boston *Post*, writing from among the oil works of Pennsylvania, says:—

The hotels are crowded, people often sleeping three in a bed, and one hears nothing talked of but "petroleum," "surface indications," "boring," territory," "pumping," &c., landlords, doctors, lawyers, ministers, blacksmiths, and almost everybody has an interest in a well bored, or being bored. As to the election, it is entirely forgotten in the eagerness of securing a fortune. A politician drove up to old Father Raymond's Rural House, in Franklin (the old man has two wells pumping fifty barrels daily) and after getting his dinner, commenced pumping the old gentleman by asking, "How is politics?" "Don't know any such well around here," replied Father Raymond. "But," says the stranger, "what is the prospect for Douglas or Breckenridge?" "Oh," says Boniface, "I don't know, it all depends on whether there are any surface indications." "But," continues his guest, "will fusion go down among you old diggers?" "Fusion," exclaims the landlord, "well, I don't know, some of these chaps called geologists say that there must be fusion below, but my opinion is that the devil has something to do with it down there before we get it." "But," says the politician, "are you not in favor of squatter sovereignty in the Territories?" "No; I will shoot anybody who dares to squat on any of my territory, and I own four miles on Sandy Creek!" "Give me my horse," says the stranger—and vamoosed.

Several mines are new being worked with success in the White Mountains, N. H. About four tuns of charcoal iron are turned out daily at the Franconia iron mine. The ore is magnetic oxyd of a very superior quality.

TROUBLE AT THE PATENT OFFICE—"REVISING BOARD" APPOINTED.

WASHINGTON, D. C., Oct. 25, 1860.

MESSRS. EDITORS:—I noticed, in your issue of the 13th, that rumor was prevalent about the Patent Office that Commissioner Thomas contemplated a restriction upon the acts of the Examiners, by appointing from one of their number a "Censor," or "literary scavenger," as you termed it, whose duties, as you enumerated them, would be multiferous. I was quite amused at your definition of the proposed duties of the appointee to the Censorship, and, at the same time, startled at the thought of so great a responsibility being imposed upon a single individual.

Having friends in the Patent Office, and not knowing exactly what was meant by the movement which your paragraph foreshadowed, I set about to learn the true facts, that you might communicate them to the inventors of the country through your journal. I learn that the new bureau has been officially created by appointing two monitors, instead of one; that Messrs. Taylor and Peale have been transferred from their respective rooms as Examiners to this exalted position, and are to be termed the "Revising Board." The duty of this board is to act as sentinel or watch-dog over all the other Examiners. In other words, the common Examiners are required by the new rule to make obeisance to their former associates who comprise this new board, in the shape of written reports to be submitted to them, setting forth their reasons or motives for granting each and every patent. The duty of the Revising Board is to examine and determine if the reasons alleged by the Examiner for ordering the patent to issue are, in their estimation, ample; and if so, they are confirmed for issue; but if not, they are withheld. So you see the work of twelve principal, and as many more assistant, Examiners are reviewed by these two new appointees, in whom is vested power to grant or withhold, as they may see fit.

Of the two gentlemen forming this new board, on whose shoulders rests the responsibility of granting or rejecting all applications for patents now made, I will add a few words. They are among the oldest Examiners in the Office, but, while they possess abundant talent and are skilled in the arts and sciences, I think you will agree with me in the opinion that they are not suited for the duties imposed upon them. They will act honestly, I have no doubt, but they have been educated in the illiberal old school practice of the Office, which prevailed as far back as 1850, '51 and '52, when terror to the inventor reigned triumphant,* and will, I fear, unwittingly return to their early proclivities, forgetting the injunction of Commissioner Mason when he was at the head of the Office.

I am fearful that the constituting of this new board on the part of the Commissioner is the commencement of a retrograde movement in the prosperity of the Patent Office, and I shall not be surprised to see the number of applicants for patents greatly diminished under the new order, while patent solicitors will reap a rich harvest from the increased number of cases which will be rejected, and subsequently appealed to a higher tribunal. If the machinery in the Patent Office becomes much more complicated, it will, by and by, require an attorney more astute than a Philadelphia lawyer to obtain a patent for his client. I shall await, with interest, the working of this new rule, and may write you again, noting the result of my observations. LIBERAL.

[While we have no great fear for the success of the inventor and applicant for a patent under the new rule, we are apprehensive the prosperity of the Office and harmony of feeling among the Examiners in the Office will not be promoted. We shall examine the working of this new piece of official mechanism introduced by the Commissioner, and referred to by our correspondent, and discuss the subject in some future issue.—EDS.

ANOTHER VARNISH FOR PATTERNS.

MESSRS. EDITORS:—I find a solution of gum shellac in burning fluid (alcohol and spirits of turpentine), with lampblack, makes a very good varnish for ordinary pattern work, giving a body by successive coats. I prefer the fluid to clear alcohol; besides with us it is cheaper.

C. P. S. W.

Lake Village, N. H., Oc. 15, 1860.

* It was in these years that two-thirds of the applications for patents were rejected. In 1852 Judge Mason was appointed to the Commissionership, and he soon brought about a new order of things, by impressing upon the Examiners the fact that it was their duty to see on what points in an invention placed before them a patent could be allowed, instead of studying to discover on what grounds they could reject an application; and thus has the Office, for the past eight years, continued to flourish, and patentees to prosper, up to the present time.

THE POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

[Reported expressly for the Scientific American.]

The usual weekly meeting of this association was held at the Institute rooms, on Thursday evening, 18th ult.—Professor C. Mason presiding.

MISCELLANEOUS BUSINESS.

Expansion of Steam.—Mr. Rowell proposed a problem as follows: Let there be two vertical cylinders of two cubic feet capacity each. In the lower half of each steam at 60 lbs. over atmospheric pressure; in the upper half of one let there be a vacuum, and in the upper half of the other steam at atmospheric pressure. Now, let the steam in both cylinders be expanded, it is required to show what will be the resulting pressure.

The problem led to an animated discussion, and while all seemed to admit that the final pressure would be somewhat less than what a literal interpretation of Mariotte's law would require, yet there was no agreement as to the exact amount of variation. Mr. Dibben, however, contended that there is a variation of precisely 4.6 per cent on expanding steam to a double volume.

At the usual time—half-past eight o'clock—the president called up the regular subject:—"Recent Practical Applications of Magnetism."

DISCUSSION.

The President remarked that his attention had been recently called to some experiments now in progress on the New Jersey Central Railroad, bearing on the utility of increasing the adhesion of car wheels to rails by means of magnetism. The magnetizing of locomotive driving wheels is not new. Several plans have been proposed and tried, especially in France, and it is admitted that the previous attempts have been failures. In all of these inventions the wheel is magnetized by means of an electric current—the wheels are made electro-magnets. Some have proposed to apply helices to the spokes of the wheel, or in other ways, so as to revolve with it. But in the New Jersey invention, the helices are stationary and inclose the lower part of the wheel, and are bent so as to correspond to the curve of the wheel. One of the difficulties (which I understand has been recently overcome) is a suitable battery. A battery of power constancy, and easy of management, is required. It is said that, by this use of magnetism, the engineer may dispense with the sand box on wet rails, and that the power of traction of any light locomotive may be almost indefinitely increased. The experiments seem to have been a complete success.

Mr. Seely—In my opinion, if such experiment had first been proposed and discussed among men of science they would never have come to actual trial. If the facts are precisely as the president seems to believe, there is here another case where facts exist in spite of the views of scientific men. In the absence of details of the apparatus and experiments, we can discuss the subject only in view of the established laws of magnetism and our limited experience, and hope we may be proved to be in error if we condemn the project of magnetizing car wheels. There is a special advantage in magnetism for producing adhesion when we can get enough of it, in our power of controlling it, using little or none when we do not need it, and a great deal in emergencies; thus enabling us to use a light locomotive for all purposes. But there is the essential and difficult—perhaps impossible—condition of our ability to produce the magnetism. There is no peculiar virtue in magnetism over gravity to produce adhesion where the pressure is the same. A strip of light iron, attracted to a magnet with a force of 100 lbs., will slip with precisely the same force as a 100 lb. weight on another piece of matter when the surfaces in both cases are in the same condition. The law of all kinds of attraction or influences is precisely the same, *i. e.*, the force varies inversely as the square of the distance. In the case of gravity, the centers of attraction are in the locomotive and the center of the earth, and as these points are very far removed, the variation of attraction, by raising the car from the track or by imperfect contact, is practically nothing. But the case with the magnetism is far different; for here the centers of attraction are in the wheel and in the rail, and very near their surfaces, so that a slight variation of the distance will have an immense effect on the practical power of the magnetism. It is well known that, if you interpose a piece of paper between a magnet and its armature, the lifting power of hundreds of pounds is lessened to a few ounces. Particles of dust or a film of oxyd seriously interferes with the use of a magnet. Now, on the railroad, admitting that you may have an attraction of a thousand pounds when the wheel is in perfect metallic contact, such a contact cannot be practically maintained. The attraction would be, in fact, a series of jerks, which, if the car jumped from the track, would tend to carry the rail with it. But, as I have intimated, it is not to be expected that a car wheel can be made a powerful magnet. Its shape and the quality of the iron forbid it. When all of the very great difficulties of the battery—its bulk, its acid fumes and its complexity—are overcome, there is yet left the difficulty of the peculiar action of magnetism. It requires time to make a magnet of iron; the maximum effect of the electric current is not shown at once, and, moreover, time is required to induce magnetism into an armature, before the maximum weight is lifted. The wheel has its pole at the bottom, and unless it is revolved slowly, it will not receive enough magnetism to have useful effect, however powerful the battery or perfect the helix.

Mr. Dibben—The lifting power of a magnet is much modified by the shape and surface of its poles, and the shape, surface and weight of the armature. If there be but a single point in contact, the attraction will be almost nothing. This must be somewhat the case of the wheel and the rail; for if both are mathematically true in form, the parts in contact will be only the tangent line. The battery may be perfect and the wheel saturated with magnetism, and still the attraction to the rail be almost inappreciable.

Mr. Seely—Perhaps it is this little effect which the experimenters reckon on, remembering that it was the last hair which broke the camel's back. (Laughter.)

Professor Hedrick believed that, if the wheels of a locomotive be magnetized to complete saturation, the locomotive, by means of a crane, could be lifted from the track by a few hundred pounds beyond its weight.

Mr. Dibben—The most powerful electro-magnets are made only of the purest and softest iron, a kind of iron which never gets into car wheels or rails.

The President—It is evident that the closeness of contact of the wheel to the rail will be increased by the weight of the car, and this greater contact will favor the magnetic attraction. Now, I wish to ask how great is the practical effect of this fact.

This point was spoken to by several members, but no conclusion was arrived at as to the definite law which governs the case.

Mr. Garvey—The law of attraction has been correctly stated when the force radiates from a point; but when there are an infinite number of points, or a surface even or uneven, the law in practice is found very different. A magnet may be so shaped that the attraction shall vary inversely as the distance, and in the case of the wheel this may be near the fact. It is known that magnetism produces a molecular change in iron, and it may be such a change as will materially favor adhesion. One well authenticated experiment is better than a month of theoretical discussion.

Mr. Johnson—What rate of speed was used in the New Jersey experiments?

The President—The experiments were with freight trains, which run at the rate of from 12 to 15 miles per hour.

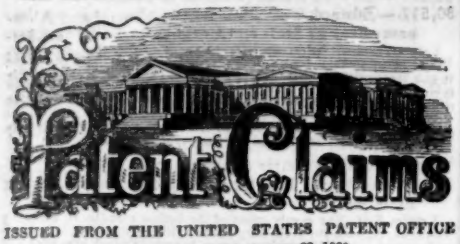
Mr. Johnson—The rails would soon become permanent magnets.

The President remarked that the gentlemen conducting the experiments were desirous of having a fair and full examination of the subject, and had authorized him to say that it would be agreeable to them to communicate with a committee appointed by the society.

A committee—Messrs. Seely, Dibben and Hedrick—were thereupon appointed.

Mr. Seely—It should be understood that, in the absence of actual experience, we have only theorized on this subject. We are willing and anxious to receive further light, even enough to confute us. We have no pride of opinion in the matter.

Subject for next week—"Caloric Engines."



ISSUED FROM THE UNITED STATES PATENT OFFICE
FOR THE WEEK ENDING OCTOBER 23, 1860.

[Reported Officially for the SCIENTIFIC AMERICAN.]

. Pamphlets giving full particulars of the mode of applying for patents, size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

30,449.—Samuel Aldrich and Alexander Aldrich, of Washington, D. C., for an Improvement in Devices for Elevating Water from Wells, &c.:

We claim the arrangement of the brake lever, H, with the sliding rod, h, and movable pawl, f, attached, in combination with the ratchet crank handle, B, for the purposes set forth.

30,450.—T. F. Allen, of Dyersville, Iowa, for an Improvement in India-rubber Railway Car Springs:

I claim the use, in the construction of railway cars, of india-rubber balls, resting on the truck and supporting the car body, and held between concave plates, substantially as described.

30,451.—Francis Arnold, of Middle Haddam, Conn., for an Improvement in Clothes' Squeezers:

I claim, first, Making the india-rubber roller, H, with a central division, h', in its aperture, I, to receive a corresponding slitted shaft, I', substantially as and for the purpose described.

Second, I claim the combination of the oscillating frame, C, rollers, H, studs, B, arranged and operating substantially in the manner as and for the purpose described.

30,452.—Wm. H. Babcock, of Homer, N. Y., for a Printing-press:

I claim, first, Supporting the vibrating bed, C, upon one or more parallel radius rods, E E, substantially as and for the purpose described.

Second, The peculiar form of the distributing table, P, attached to the vibrating bed, C, and arranged relatively to the sweep motion of the inking rollers, M, substantially as described and for the purpose set forth.

Third, Operating the gage, T, to release the printed card, by means of the catch, V, and tripper, W, substantially in the manner specified.

30,453.—Uriah Baker, of Brooklyn, N. Y., for an Improved Egg-beater:

I claim the use of the two independent spirals, C and E, in combination with the spindle, A, and reciprocating agitatory slide, H, having attached to its ends pins or other equivalent devices, for rotating the egg-beaters simultaneously in opposite directions, as described.

30,454.—D. A. Balmer, of Lexington, Ind., for an Improvement in Leveling Millstones:

I claim the arrangement of the ring, D, with the set screws, E, and central screw, B, in combination with the inner ring, B, yoke, F, and arms, I, the whole being constructed and operating as and for the purpose set forth.

[The object of this invention is to arrange two sweeps over the face of a millstone in such a manner that all the inequalities existing in said face can be easily detected and mended without removing the instrument from the stone.]

30,455.—J. W. Barnes, of Murfreesboro', N. C., for an Improvement in Attaching Horses, &c., to Two-wheeled Vehicles:

I claim the combination of the fore bar or breast tree, f, the side bars or shafts, e e, and swingle-tree, b, with the pole or tongue of a two-wheel cart or carriage, in the manner and for the purposes set forth.

30,456.—Henry Barth, of Cincinnati, Ohio, for a Printing-press Feeder:

I claim "feeding out" the paper from a printing-press by means of the tape rollers, a b c d, frame, H, receiving table, G, and tapes, f, when combined, arranged and operating substantially in the manner described—that is, when the rollers, b e, are caused to traverse above the stationary table, G, depositing the printed sheet thereon, or when the table, G, is caused to reciprocate under the stationary tape rollers, b e, for the purpose of receiving the printed sheet therefrom, in the manner essentially as described.

Second, I claim the elastic supports, e e', carrying the auxiliary tape rollers, d d', when used in combination with the reciprocating tape rollers, a a', b b', or the reciprocating table, G G', substantially as described.

30,457.—S. L. Bond, of Greenwood, S. C., for an Improvement in Harness:

I claim the combination of the collar, B or G, with the back strap, I, when both are attached to the thills, A A, as and for the purpose specified.

[The object of this invention is to attach a horse to a wagon in a much simpler way than by the ordinary harness, and with far less expense. The invention consists in attaching the collar to the shafts and also the back straps, whereby the desired end is attained.]

30,458.—G. S. Bosworth, of Troy, N. Y., for an Improvement in Car Wheels:

I claim the described cast iron car wheel cast in one piece with the chilled rim connected to the hub by means of a single undulating concavo-convex plate, which has two or more annular waves concentric with the hub and rim, substantially as represented in the drawings.

30,459.—D. R. Brown and A. C. Babcock, of New Haven, Conn., for an Improved Shaft Tug:

I claim a hinged shaft tug, constructed and operating substantially in the manner described.

30,460.—J. H. H. Bennett, of Hunt's Hollow, N. Y., for an Improvement in Gates:

I claim the arrangement of the lever, D, with the hinge, E F, strip, A, post, B, arm, G, cords, h h, pulleys, i i, j j, posts, H, shafts, K K, traps, J, and plates, I I, all as set forth and described, for the purposes specified.

[This invention consists in the arrangement of a bent two-armed lever passing through the hinges of the gate, and secured to its top edge in combination with a hollow hinge at the bottom, and with a double-jointed hinge at the top in such a manner that on turning the lever in either direction, the gate is released from the latch, and brought in an inclined position, causing it to swing open or to close as the case may be; also in the peculiar arrangement of a trap for the purpose of returning the rope, and releasing it at the proper time, if the gate is to be opened, and closed by the action of the wheel or wheels of a vehicle.]

30,461.—Thomas Byrne, of Baton Rouge, La., for an Improvement in Refrigerators:

I claim the arrangement of a pipe, A, which is higher than the refrigerator, and is enveloped with cloth or any fibrous substance, F, and has a water reservoir, B C, on its upper end, and a drip funnel, D E, encircling it, in combination with a refrigerator, G, in the manner and for the purposes described.

30,462.—Wm. S. Carr, of New York City, for an Improvement in Water Closets:

I claim a hollow plunger valve moving within a cylinder, and controlled substantially as specified, to form both a water way and valve, as set forth.

30,463.—J. C. Clime, of Camden, N. J., for an Improved Arrangement of Mechanism in Sawing Machines:

I claim the arrangement of the fly-wheel, pinion, circular saw, crank (J) and scroll saw, in the manner and for the purpose substantially as set forth.

30,464.—J. B. Coffin, of Hayesville, Ohio, for an Improvement in Washing Machines:

I claim the arrangement of the disks, F and G, one being provided with pins, i, and the other with squares, h, attached to the opposite ends of an arbor, f, in combination with the swivel head, E, and with the oscillating double slotted lever, D, constructed and operating substantially as and for the purpose set forth.

I also claim the arrangement of the spring catch, h, in combination with the grooves, g, in the arbor, f, for the purpose described.

[This invention consists in the arrangement of two disks operating in an ordinary wash tub, one for pounding and the other for rubbing and squeezing the clothes on the opposite ends of a vertical shaft, in combination with a swivel head, to which said shaft is fastened by a spring catch, and which has its bearings in the arms of a double slotted oscillating lever, in such a manner that either one of the disks can be brought to operate on the clothes, and that the rubber may be used for rubbing or squeezing as may be desired,

30,465.—C. W. Curtis, of New Haven, Conn., for an Improved Collapsible Bucket:

I claim, as a new article of manufacture, a portable bucket made of a skeleton or frame composed of a bottom and one or more rims, and covered with india-rubber cloth, or any other suitable material, when the whole is constructed and fitted for use, substantially as described.

30,466.—F. B. De Keravenan, of New York City, for an Improvement in Lamps:

I claim a lamp supplied with an impelled current of air from a suitable blowing apparatus effecting the new and useful results specified.

30,467.—Abraham Denny and E. M. Denny, of Waterford, Ireland, for an Improved Apparatus for Singeing Pigs. Patented in England Feb. 2, 1860:

We claim the apparatus for singeing off the bristles, hairs, and other superfluous matters upon the surfaces of the carcasses of pigs, by the action of flame or heat in a stove or heated chamber, substantially as specified.

30,468.—Isaac Detheridge, Jr., of New York City, for an Improved Knife Cleaner:

I claim the operating parts, to wit, the lever and cams, L and E, working the bar, I, in combination with the adjustable, bar, J, the whole constructed and arranged substantially as and for the purposes described.

30,469.—Arthur de Witzleben, of Washington, D. C., for an Envelope Ruler:

I claim a card, A, ruled as described, and used as an envelope ruler.

30,470.—H. H. Dodge, of Georgetown, D. C., for an Improvement in Gas-burners:

I claim regulating the flow of gas to the burner, in the manner and for the purposes described.

30,471.—Wm. A. Dudley, of Petersburg, Va., for an Improvement in Apparatus for Removing Calculi:

I claim, first, The combination of the bag, E, and arms, D, for the purpose of catching and enclosing the stone to be subjected to the action of a solvent, substantially as described.

Second, The detachable segmental head, B, applied to the catheter, or canular of an instrument of this description, for the purpose of facilitating its introduction, as set forth.

Third, The combination of the tube, c, and its arms, D, and bag, E, with a catheter, A, forming a new and useful instrument for the enclosure, dissolution and removal of calculi from the human bladder, substantially as set forth, without resorting to the use of the knife.

30,472.—J. H. Fisher, of Placerville, Cal., for an Improvement in Railroad Car Seats and Couches:

I claim, first, The jointed back, E, of the seat, B, and the removable cushion, s, in connection with the supplemental hinged cushion, h; the above parts being arranged in relation with the seats, A A, as described, to form the lower berth.

Second, The platform, D, guides, C C, and uprights, o o, arranged and combined as shown, to admit of said platform being adjusted in a horizontal position for use, or being removed out of the way when not required.

Third, The side guard, F, attached to the platform, D, by means of the arms, r, substantially as shown, to admit of the guard being adjusted to the platform so that the latter may be shoved down between the guides, C C, as set forth.

Fourth, Connecting the curtain, E, to the platform, D, by means of the cords, q q', arranged substantially as shown, so that the curtain may be raised and lowered automatically by the movement of the platform.

30,473.—P. G. Gardiner, of New York City, for an Improvement in Cotton Presses:

I claim, first, The arrangement of toggle joints in combination with segments situated opposite each other, the faces of said two segments forming together a nut and operated simultaneously together by a screw or worm fast on an upright shaft, in the manner and for the purpose substantially as specified.

Second, I claim the arrangemet and construction of the top frame, C, in combination with the upright shaft, E, and segments, L L', and so arranged that said top frame shall receive the whole strain of the press and contain all the mechanism which operates the top platen, D, substantially as described.

Third, I claim the arrangement and combination of the different parts, constructed and operating together in the manner set forth and for the purposes substantially as described.

30,474.—John Gilchrist, of Berlin City, Wis., for an Improvement in Spoke Machines:

I claim the combination and arrangement of the revolving cutter, B, spoke carriage, I, lever, H, spring, G, slot, S, pivot, W, patterns, C, guard, E, screw wheel, O', and screw, D, substantially in the manner and for the purposes described.

30,475.—C. W. Griffith, of Dayton, Ohio, for an Improved Device for Adjusting the Rake of Muley Saws:

I claim fastening one end of the saw to the stock, substantially in the manner described, so that it may be adjusted to give it the desired rake or cut.

30,476.—D. A. Hopkins, of Bergen, N. J., for an Improvement in Railroad Chairs:

I claim, first, The chair constructed with a longitudinal key seat below the rail, in combination with the key, C, as described.

Second, The combination of the wedge, C, with a tapered key, D, substantially as shown, by which the wedge, C, is adjusted and kept in place, as described; and also the mode of securing the key in place by means of a curve in the end of the mortise through which it is driven, as stated.

Third, So forming the chair as to leave space immediately at the ends of the rails between their lower flanges and the lips of the chair, as set forth for the purpose specified.

30,477.—J. M. Jones, of New Orleans, La., and Jos. Charpentier, of Pattersonville, La., for an Improvement in Bagasse Furnaces:

We claim the combination and arrangement of the chimney, F, with bagasse burning chamber, A, at its base, horizontal arch, B, boiler furnace, C d, and dampers, E e, substantially in the manner and for the purpose set forth.

30,478.—A. F. Johnson, of Boston, Mass., assignor to A. B. Ely, of Newton, Mass., for an Improvement in Sewing Machines:

I claim, first, Interlacing two endless threads and forming the double thread chain stitch by means of a revolving hook, substantially as set forth.

Second, I claim a revolving hook or looper so constructed as to make a series of double thread chain stitches, when operated in connection with a reciprocating needle.

Third, I claim the peculiar construction of a hook with its hollow shaft or groove, substantially as described.

30,479.—D. A. Johnson and F. M. Gibson, of Boston, Mass., for an Improvement in Carriage Wheels:

We claim making the felloe joints in wooden wheels by halving the ends of the felloe together, surrounding the joint by a metallic band provided with an inner projecting socket piece or thimble, and inserting the outer end of the spoke through the thimble and band into the inner half, n, of the felloe, substantially as shown and described.

30,480.—W. J. Johnson, of Newton, Mass., for an Improvement in Pumps:

I claim the arrangement with the cylinder of a portable pump having a suction orifice, E, at its bottom, of an adjustable stirrup, A B, whether the part, A, is hinged or not, substantially as and for the purposes set forth.

30,481.—Frederick Kettler, of Milwaukie, Wis., for an Improved Rotary Engine:

I claim a rotary engine constructed and operating substantially as described.

30,482.—F. L. Kidder, of Brooklyn, N. Y., for an Improvement in the Running Gear of Vehicles:

I claim connecting the axle to the lower segment of the fifth wheel by the clip eyes, 2 2, and gudgeons, 1 1, for the purposes and as specified.

30,483.—David Landis, of Lancaster, Pa., for an Improvement in Screens for Flour Bolts:

I claim the rotating cylinder, D, and screen, E, the latter being placed within the former, and both arranged essentially as shown, and in such relation with the bolt to operate as and for the purpose set forth.

[The object of this invention is to separate bags from meal before the latter enters the bolt and thereby prevent the destruction of the bolting cloth, the bags soon destroying the cloth after entering the bolt.]

30,484.—W. J. Lane, of Chappaqua, N. Y., for an Improvement in Lifting Jacks:

I claim the employment or use of the plate or clamp, E, lever, D, arm, C, and bar, F, applied to a stock or upright, A, and all arranged essentially as and for the purpose set forth.

[This invention consists in the employment of a sliding clamp attached to a lever having a movable fulcrum and fitted in a suitable stock, in connection with a slide bar which passes through the clamp and has its lower end fitted in the stock; all the parts being so arranged that a very simple and efficient portable jack is obtained, and one that may be easily manipulated and applied to its work.]

30,485.—J. F. Letellier, of Grand Rapids, Mich., for an Improvement in Steam Valves:

I claim the shell as constructed, and in combination therewith the throttle valve, C, and governor valve, B, all arranged substantially as and for the purposes set forth and described.

30,486.—Sylvester Marsh, of Roxbury, Mass., for an Improvement in Grain Bins:

I claim the arrangement in grain bins of suitable form and otherwise ordinary construction, of a series of perforated tubes open at both ends secured to and inserted in corresponding holes in the bottom of said bins, so that the external air may penetrate and pervade the whole mass or body of grain, substantially in the manner and for the purposes set forth.

30,487.—Wallace Lyon, of Deep River, Conn., for an Improved Bit Stock:

I claim the arrangement of the permanent and shifting gearing, f h i j k, placed respectively on the shafts, C E F, and within the stock, A, substantially as and for the purpose set forth.

[This invention relates to an improved bit stock of that class in which the bit is rotated through the medium of gearing. The object of the invention is to obtain a bit stock which will admit of the bit being rotated with varying degrees of speed under the same speed of the crank or driving shaft, thereby enabling the implement to be adapted to different kinds of work, and rendering one and the same implement capable of a more general adaptation than usual.

30,488.—James Macdonough, of New York City, for a Style of Engraving Bank Notes, &c. Ante-dated April 23, 1860:

I claim as a new art in bank note, bond, and other document engraving, the combined use in repetition of the value or denomination, and of the configuration, substantially as and for the purpose described.

And I also claim the combined use in repetition of the value or denomination of the bank note or other document, the name or title of the person, corporation, or institution, and the configuration of geometrical, cycloidal, waved line or rosette work, substantially as described and set forth.

30,489.—Daniel Lombard, of Boston, Mass., for an Improvement in Rice Hulling Machines:

I claim the arrangement of a wire studded belt passing over drums and between serrated metallic plates or their equivalents, and the back, m, and supported on the ledges secured to l—all operating together substantially as and for the purpose described.

30,490.—John McArthur, of Aurora, Ill., for an Improved Method of Elevating Water from Wells, &c.:

I claim the swinging and balanced spout, I, in combination with the two stationary spouts, C C, in the curb, B, and the shaft, D, provided with the pulleys or wheels, E E, over which the bucket chains, F F, pass, the arms, H H, of the spout, I, being placed on the shaft, D, and all arranged essentially as and for the purpose set forth.

[The object of this invention is to obtain a simple device for drawing water from wells, designed for domestic use, and to facilitate the work so that females and children may draw the water without the least difficulty.]

30,491.—J. B. Mohler, of Pekin, Ill., for an Improvement in Grain Weighing Machines:

I claim the arrangement of the pivoted rhomboidal and divided receiving box, F, cam, H, lever, I and rod, J, with the scale beam, B, rods, C D, shaft, E, ratchet wheel, K, index, L, and plate, M, as and for the purposes set forth and described.

[The object of this invention is to obtain by a simple arrangement of means a device which will receive a continuous flow of grain from a hopper, weigh and register the grain and discharge it into any proper receptacle; the whole device working automatically, the gravity of the grain being the only motor.]

30,492.—F. Moore, of Panola, Miss., for an Improved Fan Ventilating Bedstead:

I claim the arrangement of the pendulum fan, K K, rod, L, gearing, G h F, and arms, b, and cords, a, with the bar, D, bed frame, B, and bedstead, A, as and for the purposes shown and described.

[This invention is an improvement in bedsteads, whereby a fan is kept in motion for any desirable length of time, so as to fan the sleeper and keep flies and mosquitos away. It consists in hanging a movable frame in such relation to a train of wheelwork and fan that when the parts are wound up, the weight of a person will cause the fan to vibrate as long as the parts remain wound up.]

30,493.—Murdoch Murchison, of Denmark, Tenn., for an Improvement in Cotton Presses:

I claim the arrangement of a horizontal and tilting press box, B, with a horizontal follower, H, levers, M, tackles, d, and windlass, E, when constructed and arranged substantially in the manner and for the purpose described.

I also claim hanging the cotton box, B, by its trunnions in the horizontal slots, f, of the frame, so that the press box, when in its horizontal position, can be moved longitudinally towards the resisting sill, and thus relieve said trunnions from all strain while the cotton is pressed, substantially in the manner described.

30,494.—F. D. Newbury, of Albany, N. Y., for an Improvement in Revolving Fire-arms:

I claim, first, The cocking notch lying at the base of the hook or claw of the hammer, as described, in combination with the shoulder, y, of the pawl, P.

Second, The spring, v, so arranged as by one operation to regulate the pawl, P, and at the same time act as a spring upon the trigger.

Third, Ratchet pawl, K, pivoted to the trigger, fitted and formed to act as a pawl and bolt, in combination with the holes, j j, in plate, D.

30,495.—W. H. Oakes, of New York City, for an Improvement in Plate Printing:

I claim printing from engraved plates by having the sunken portions thereof, which form the design, to be printed, charged or filled with fluid ink from below the plate, the ink being forced up through perforations in the plate against the paper or substance to receive the impression, while said paper or other substance is pressed upon or against the plate.

Second, The arrangement of the ink reservoirs, J K, with the pipes, I H, tubes, T G, pump, M, and grooves, a' j, in the block, F, and bed, U, in connection with the perforated plate, V, substantially as and for the purpose set forth.

30,496.—Adam Oot, of Minetto, N. Y., for an Improvement in Car Couplings:

I claim the combination of the peculiarly constructed draw head, A B a b c, with the peculiarly constructed gravitating lever hook, C m f g, in the manner and for the purpose described.

30,497.—N. A. Patterson, of Kingston, Tenn., for an Improvement in Cotton Gins:

I claim the combination, with the combined fan and brush cylinder, C, of the rollers, B, when the above parts are arranged to operate together in the manner and for the purpose shown and described.

30,498.—G. P. Plant and Julius Raith, of St. Louis, Mo., for an Improvement in Ventilating Mill Stones:

We claim the arrangement together, as shown and described, of the sucking and drawing fan, B, settling room, J, hung with cloths, K, dust tube, G, curb, A, tube, F, stone, E, spout, H, and clapper, I, so that a current of air will be drawn down the eye of the stone through the furrows to ventilate the stone, and so that the dust will, at the same time, be drawn up away from the stones and driven into the settling room, J, where it will be received by the cloths, K, all as set forth.

[This invention consists in producing within the curb of the stone a partial vacuum by means of a fan, and thereby causing a current to pass down through the eye of the stone and between the upper and lower stones.]

30,499.—Miles Pratt, of Watertown, Mass., for an Improvement in Cooking Stoves:

I claim the employment of the independent return flue, G, in combination with the independent oven, B, when the whole is so constructed and arranged that the products of combustion shall first pass entirely around the oven, in direct contact with it and surrounding the return flue, G, and then through the said return flue, as specified, for the purpose set forth.

30,500.—A. Randel, of New York City, for an Improvement in Presses:

I claim the rack bars, E E, provided with the racks, a a b, and actuated through the medium of the pinions, c c, in connection with the cross-head, F, provided with the pawls, j, and actuated through the medium of the eccentrics, m m, all being arranged essentially as and for the purpose set forth.

[The object of this invention is to obtain a press of simple and economical construction, which will admit, under the same application of power, of giving two different degrees of pressure, so that the substance may be compressed expeditiously and in a proper manner, an excess of power being dispensed with for speed, and the latter dispensed with when power is required.]

30,501.—M. E. Rudasill, of Shelby, N. C., for an Improvement in Machines for Cutting Stalks, &c.:

I claim the employment of the revolving reel composed of the rims or disks, H H, and knives, a a, in combination with the stationary reel composed of the rims, I I, and knives, c c c, the same being arranged and used substantially as and for the purpose specified.

30,502.—Philander Shaw, of Abington, Mass., for an Improved Boot-crimping Machine:

I claim, in combination with the sliding block, E, and nippers, F, the eccentric arc, G, with its hand piece, k, ratchet wheel, H, and retaining pawl, n, the whole arranged and operating as described, for the purpose set forth.

I also claim the employment of an index on the ratchet wheel, H, in combination with the stretching device, substantially as described, for the purpose set forth.

30,503.—M. J. Shinn, of Richmond, Ind., for an Improved Apparatus for Detecting Fraud in Ballot Boxes:

I claim, first, The "detector" described, or any equivalent for the same, attached to a ballot box, to indicate and expose tampering with the lock or cover of the same.

Second, I claim the device described as a "register" for registering the number of votes polled, consisting of ratchet wheel, R, index wheels, O and P, slide, U, rocking shaft, N, with arms, H H and b, and thumb lever, H, together with lock pin, M, falling lever, k, stops, L L, all arranged substantially as and for the purpose set forth.

30,504.—Abijah Smith, of Kingston, N. Y., for an Improvement in Machines for Dressing Stone:

I claim the combination of vibratory beams, A B C, connecting rods, c d e, crank, K, of the shaft, W, lever, E, having the stay rods attached thereto, and the serrated iron tools and rubbers; these severals parts being constructed and arranged for operation in the manner described, for the purpose set forth.

30,505.—I. A. Stafford, of Essex, N. Y., for an Improved Furniture Caster:

I claim making a joint in the caster stirrup, so as to enable it to reverse its position and form an angle right or left, in the manner described and for the purposes specified.

30,506.—I. A. Stafford, of Essex, N. Y., for an Improvement in Machines for Elevating, Cleaning and Bagging Grain:

I claim the peculiar construction and attachment of the elevating and screening mechanism as applied to a fanning mill, for the purpose of sacking grain, as set forth.

30,507.—N. M. Stratton, of New York City, for an Improvement in Fences:

I claim the construction of fence described, consisting of the rails, C C, and pickets, B B, united by means of hooks, A A, on the part and corresponding notches or slots in the other part, the hooks and recesses being adapted to fit together so that the parts are kept in their proper positions without any additional means, and so as to cause the pickets to stand erect when the line of the fence is inclined, all substantially as set forth.

30,508.—J. S. Stuart and A. L. Corson, of Marblehead, Mass., for an Improved Machine for Dressing Boot and Shoe Heels:

We claim the explained mode of applying the knife carrier, E, to the spring lever, I, viz.: by the pivot, i, and the arm, l, adjustable with respect to the lever and connected with the knife-carrier, substantially as described.

We also claim the combination and arrangement of the regulating lever, N, and screw, O, with the knife-carrier, E, its guide roller, M, and pattern, a.

We also claim the arrangement of the bearing faces of the heel-supporting jaws with respect to the plane of movement of the cutter in making the bevel of the sides of the heel.

30,509.—A. E. Taylor, of Ogdensburgh, N. Y., for an Improved Bell Attachment:

I claim the hammers, g, operating through the medium of the revolving arbor, E, studded disk, F, lever, D, and the lever or levers, d, with the spring or springs, f and h; the above parts being arranged relatively with the bell, C, to operate as and for the purpose set forth.

[This invention consists in arranging, with a stationary bell attached to a door or door-post, a striking mechanism, in such a way that, by rotating a crank in either direction, a hammer will be actuated and the bell struck. The invention is designed to supersede the employment or use of the ordinary knockers and, in many cases, the usual door bells which are actuated by pulls.]

30,510.—J. D. Tracy, of Springfield, Mass., for an Improved Attachment for Bridle Bits:

I claim the construction of the bit with the lower parts of the cheek pieces, B B, made in loop form, and provided with muzzling rods, c c, so as to prevent the animal from biting, all as shown and described.

[Horses, as is well known, frequently contract a habit of grasping with their teeth articles within their reach, and while biting hard upon them inflate themselves with wind. This habit is technically termed "cribbing," and is very injurious to the animal, rendering him exceedingly hard to keep, and eventually destroying utterly the style or general good appearance he may naturally have. The object of this invention is to prevent the practice of this habit while the animal is in harness, and to this end the cheek pieces of the bit are extended, so that they may project a trifle in front of the mouth of the animal and connect the ends of the cheek pieces by reeds so as to form a sort of muzzle, which, while effecting the desired result, will admit of the perfect free movement of the bit equally as well as if the invention was not applied to it.]

30,511.—N. B. Webster and R. W. Young, of Portsmouth, Va., for an Improvement in the Prevention of Incrustation of Steam Boilers:

We claim connecting with the interior of a steam boiler a metal electro-negative to the metal of the boiler, substantially as and for the purpose set forth.

30,512.—J. B. Wheeler, of Chicago, Ill., for an Improved Machine for Drying and Cooling Grain:

I claim, first, The arrangement of the inclined perforated bottom, C, and the hot air passages connecting the chamber above it with the air heating chamber, substantially as described.

I also claim, in combination with the drying chamber, the external perforated trunk, G, and fan blower, D, for drawing the moistened and heated air from the grain and returning it to the heating chamber, whilst cooler air takes its place among the grains, substantially as described.

30,513.—J. P. Wilson and F. V. Wilson, of Ilion, N. Y., for an Improved Revolving Spool Stand:

We claim the described article of manufacture, constructed and arranged substantially in the manner and used for the purpose specified.

30,514.—G. G. Wolfe, of Troy, N. Y., for an Improvement in Cooking Stoves:

I claim the combination and arrangement of the air heating chamber, G, hot air passage, H, opening, J, flue space, K, opening or openings, L, and aperture or apertures, M, with the oven, A, fire-box, B, and smoke flues, C, along the top, back and bottom of the oven, substantially as shown and described.

30,515.—R. B. Wright, of Norfolk, Va., for an Improved Ventilator for Railroad Cars:

I claim, first, Hinging a dust and spark deflector between two car windows, so that it may be applied to either of the windows, according to the direction in which the car travels, as set forth.

Second, A V-shaped frame, C C', hinged at J, and provided with a sash, D, in the center of the said V-shaped frame, in combination with a wing of wire gauze, H, hinged to the edge of the sash, so as to shut against either of the arms, C or C', of the V-shaped frame, substantially as and for the purposes set forth.

30,516.—A. T. Ballantine (assignor to himself and T. O. Conkling), of New York City, for an Improved Box for Dropping Sugar:

I claim, first, The combination with a suitable hopper, A, of a rotary dropping wheel, C, spring, e, lever, D, pall, c, and ratchet wheel, or their equivalents, arranged and operating as and for the purposes set forth.

Second, I claim the vibrating wire frame, G, placed within the hopper, A, and operating as and for the purposes set forth.

[This invention consists in arranging at the bottom of a hopper of any desirable shape or capacity a discharging device, whereby a definite quantity of sugar will be discharged from the hopper by the movement of a lever suitably applied to the box. It further consists in the employment of a wire agitator, which is operated by the dropping device, so as to keep the sugar loose in the hopper, and prevent it from clogging up the throat of said hopper.]

30,517.—Edward Burke (assignor to himself and Abraham Sulger), of Philadelphia, Pa., for an Improvement in Seats and Couches for Railroad Cars:

I claim, first, The described arrangement of the sliding boards, H and H', with their legs, a a, the hinged leaves, I, when the whole is combined with the base, D, of a car seat having the usual reversible back, G, as set forth.

Second, I claim the platforms, J and K, guided and retained in position by the permanent rods, M and L, connected together by the jointed rods, P, and to the roof by the jointed rods, N; the whole arranged and operating as and for the purpose specified.

30,518.—George Fetter (assignor to S. Pancoast), of Philadelphia, Pa., for an Improvement in Sewing Machines:

I claim, first, The combination of the hollow spindle, G, carrying the hook, N, with the stationary shaft, I, the hollow disk, J, and annular cap, L, and discoidal spool case, the whole being arranged and operating substantially as set forth and for the purpose specified.

Second, I claim the guard, M, or its equivalent, carried by the hollow spindle, G, and arranged, in respect to the needle, x, and hook, N, as specified.

30,519.—G. C. Gourlay (assignor to himself and Andrew Huntley), of New York City, for an Improvement in Port Lights for Vessels:

I claim the construction of the face of the rim, A, with one or more annular grooves, c, as shown and described.

[This invention consists in forming the case or rim of the upper port light with an annular groove or recess in its outer side, and in such relation with an annular groove or recess in the face side that a certain yielding capacity will be allowed the case or rim, and the latter made to fit snugly the side of the vessel, the seams in the outer side of the rim or case also serving as a packing receptacle.]

30,520.—C. H. Griffin, of Lynn, Mass., assignor to W. D. Richards, of Boston, Mass., for an Improved Machine for Cutting Boot and Shoe Soles:

I claim the combination of the traveling pressure bar, F, and block with the rotating die block, J, and dies, g, when such are held stationary during the operation of cutting, substantially as described.

I also claim the stop bolt, K, as operated, and notched disk, Q, or their or either of their equivalents, in combination with the rotary die block, J, for the purposes described.

I also claim the described combination of the disk, l, spring catch, o, and notched ring gear wheel, H, as operated, or their or either of their equivalents, with the rotary die block, J, and its pinion, R, and shaft, p, for the purpose set forth.

And, lastly, I claim the gages, y, as arranged, constructed and operated, for the purpose described.

30,521.—F. F. Myer (assignor to himself and Augustus Scheller), of New York City, for an Improvement in the Manufacture of Chloride of Lead:

I claim the method, substantially as described, of treating sulphate of lead with chloride of sodium, for the purpose set forth.

30,522.—T. A. Morris (assignor to himself and F. R. Schettler), of Green Bay, Wis., for an Improvement in Crushing and Pulverizing Quartz:

I claim, first, The rotating cylinder, E, provided with a bed or bottom formed of rocks, g, in connection with the drags, H, one or more, arranged substantially as and for the purposes set forth.

Second, The combination of one or more pairs of crushing rollers, B B, with the rotating cylinder, E, and drags, H, one or more, arranged for joint operation as and for the purpose specified.

30,523.—J. J. Watson, of Buffalo, N. Y., assignor to himself and Solon Dike, of Columbia, S. C., for an Improved Method of Adjusting the Rake of Reciprocating Saws:

I claim the movable head timber, M, to which the top of the saw is connected by means of the guide, O; said timber being provided with tenons which pass through openings in the frame pieces, A A, and being adjusted by wedges or keys, substantially as and for the purpose specified.

30,524.—R. H. Gratz and C. C. Lloyd, of Philadelphia, Pa., assignors to R. H. Gratz aforesaid, for an Improvement in Dry Gas Meters:

I claim placing the inlet, A, at the bottom of a dry gas meter, thereby producing simplicity in the attachment and permitting the liquid condensation to flow direct into the main, substantially as set forth.

RE-ISSUES.

Owen Dorsey, of Dorseyville, Md., for an Improvement in Harvester Rakes. Patented March 4, 1856:

I claim, first, In combination with a curved horizontal platform of a harvesting machine, a continuously revolving raking device, the rakes of which rise and fall as they rotate, and, as they approach the front part of the platform, descend to the level of the latter and sweep over it, raking the cut grain therefrom, and then rise at the discharge end of the platform out of the way, and move toward the front end of the same to repeat the operation, substantially as described.

Second, The construction of the raking device, as shown and described, to wit: the rake arms, c c c c, each pair being slotted at their centers and pivoted on the rotating shaft, i, to admit of the rotating and modulating or rising and falling movement of the rakes, substantially as described.

Third, In combination with the rake arms, c, the inclined cam way or rail, f, the latter serving as a guide for the former, as specified.

[This invention consists in the use of a continually-revolving raking device, in connection with a horizontal curved platform, over which the rakes move, the raker being so operated that its rake or rakes descend as they approach the forward end of the platform and move back over it in a horizontal curved plane, sweeping the cut grain therefrom, and rising after accomplishing their work, so as to pass in an elevated position out of the way and toward the forward end of the platform for a succeeding operation.]

B. M. Nyce, of Kingston, Ind., for an Improved Refrigerator. Patented Nov. 2, 1858:

I claim, first, The insulated and cooled preserving chamber, J, provided with an atmospheric agitator, K, and absorbent, F, operating substantially as and for the purposes set forth.

Second, The construction of the beam, T, having a metallic upper portion, x, and a water-collecting through, y, substantially as and for the purposes explained.

Third, The insulating cover, O, of the ice reservoir, arranged and applied substantially as and for the purposes set forth.

Hiram Van Steenburgh and Joel Egnor (assignors to themselves and Peter Bauhyte), of Catskill, N. Y., for an Improvement in Apparatuses for Hoisting and Storing Ice. Patented Nov. 30, 1858:

We claim the method of transporting ice upon inclined planes by carrying the ice up between parallel endless chains, having bars extended between said chains to hold the ice and to propel the same; the planes being pierced with openings for the passage of the ice to the successive stories of the ice houses, and the propelling bars being so arranged that the descending bars shall not interfere with the free passage of ice through the openings in the planes.

We also claim the use of inclined planes for elevating ice when each is provided with the two parallel endless chains, with suitable bars

between them at proper distances apart to hold and propel the ice, when the planes are provided with spaces which can be left open when the ice is to be elevated to the hight of those openings, respectively, and which can be successively closed when the ice is to elevated to a greater hight, substantially in the manner set forth.

We further claim the use of the hatches described, to close the openings in the plane, in order to permit the ice to pass beyond a lower to an upper story of an ice house, when used in combination with the two parallel endless chains, substantially as described and set forth.

THE RISE AND PROGRESS OF INVENTIONS

During the period of Fourteen Years which has elapsed since the business of procuring patents for inventors was commenced by MUNN & Co., in connection with the publication of this paper, the number of applications for patents in this country and abroad has yearly increased until the number of patents issued at the United States Patent Office last year (1859) amounted to 4,538; while the number granted in the year 1845—fourteen years ago—numbered 502—only about one-third as many as were granted to our own clients last year; there being patented, through the Scientific American Patent Agency, 1,440 during the year 1859. The increasing activity among inventors has largely augmented the number of agencies for transacting such business.

In this profession, the publishers of this paper have become identified with the universal brotherhood of Inventors and Patentees at home and abroad, at the North and the South; and with the increased activity of these men of genius we have kept apace up to this time, when we find ourselves transacting a larger business in this profession than any other firm in the world.

We may safely assert that no concern has the combined talent and facilities that we possess for preparing carefully and correctly applications for patents, and attending to all business pertaining thereto.

FREE EXAMINATION OF INVENTIONS.

Persons having conceived an idea which they think may be patentable are advised to make a sketch or model of their invention, and submit to us, with a full description, for advice. The points of novelty are carefully examined, and a reply written corresponding with the facts, free of charge. Address MUNN & CO., No. 37 Park-row, New York.

PRELIMINARY EXAMINATIONS AT THE PATENT OFFICE.

The advice we render gratuitously upon examining an invention does not extend to a search at the Patent Office, to see if a like invention has been presented there, but is an opinion based upon what knowledge we may acquire of a similar invention from our long experience, and the records in our Home Office. But for a fee of $5, accompanied with a model or drawing and description, we have a special search made at the United States Patent Office, and a report setting forth the prospects of obtaining a patent, &c., made up and mailed to the inventor, with a pamphlet, giving instructions for further proceedings. These preliminary examinations are made through our Branch Office, corner of F and Seventh streets, Washington, by experienced and competent persons. Over 1,500 of these examinations were made last year through this office, and as a measure of prudence and economy, we usually advise inventors to have a preliminary examination made. Address MUNN & CO., No. 37 Park-row, New York.

CAVEATS.

Persons desiring to file a caveat can have the papers prepared on reasonable terms, by sending a sketch and description of the invention. The government fee for a caveat is $20. A pamphlet of advice regarding applications for patents and caveats furnished gratis on application by mail. Address MUNN & CO., No. 37 Park-row, New York.

HOW TO MAKE AN APPLICATION FOR A PATENT.

Every applicant for a patent must furnish a model of his invention, if susceptible of one; or if the invention is a chemical production, he must furnish samples of the ingredients of which his composition is composed for the Patent Office. These should be securely packed, the inventor's name marked on them, and sent, with the government fee, by express. The express charges should be prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by draft on New York, payable to Munn & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents; but if not convenient to do so, there is but little risk in sending bank bills by mail, having the letter registered by the postmaster. Address MUNN & CO., No. 37 Park-row-New York.

REJECTED APPLICATIONS.

We are prepared to undertake the investigation and prosecution of rejected cases, on reasonable terms. The close proximity of our Washington Agency to the Patent Office affords us rare opportunities for the examination and comparison of references, models, drawings, documents, &c. Our success in the prosecution of rejected cases has been very great. The principal portion of our charge is generally left dependent upon the final result.

All persons having rejected cases which they desire to have prosecuted are invited to correspond with us on the subject, giving a brief history of their case, enclosing the official letters, &c.

FOREIGN PATENTS.

We are very extensively engaged in the preparation and securing of patents in the various European countries. For the transaction of this business we have offices at Nos. 66 Chancery Lane, London; 29 Boulevard St. Martin, Paris; and 26 Rue des Eperonniers, Brussels. We think we can safely say that three-fourths of all the European patents secured to American citizens are procured through our Agency.

Inventors will do well to bear in mind that the English law does not limit the issue of patents to inventors. Any one can take out a patent there.

Circulars of information concerning the proper course to be pursued in obtaining patents in foreign countries through our Agency the requirements of the different Patent Offices, &c., may be had gratis upon application at our principal office, No. 37 Park-row, New York, or either of our branch offices.

CAUTION TO INVENTORS.

Messrs. MUNN & CO. wish it to be distinctly understood that they neither buy nor sell patents. They regard it as inconsistent with a proper management of the interests and claims of inventors, to participate in the least apparent speculation in the rights of patentees. They would also advise patentees to be extremely cautious into whose hands they entrust the power to dispose of their inventions. Nearly fifteen years' observation has convinced us that the selling of patents cannot be conducted by the same parties who solicit them for others, without causing distrust.

BUSINESS CONDUCTED CONFIDENTIALLY.

We would inform inventors that their communications are treated with the utmost confidence, and that the secrets of inventors confided to us are never divulged, without an order from the inventor or his acknowledged representative.

TESTIMONIALS.

The annexed letters, from the last three Commissioners of Patents, we commend to the perusal of all persons interested in obtaining Patents:—

Messrs. MUNN & Co.:—I take pleasure in stating that while I held the office of Commissioner of Patents, MORE THAN ONE-FOURTH OF ALL THE BUSINESS OF THE OFFICE CAME THROUGH YOUR HANDS. I have no doubt that the public confidence thus indicated has been fully deserved as I have always observed, in all your intercourse with the Office, a marked degree of promptness, skill and fidelity to the interests of your employers. Yours, very truly,

CHAS. MASON.

Immediately after the appointment of Mr. Holt to the office of Postmaster-General of the United States, he addressed to us the subjoined very gratifying testimonial:—

Messrs. MUNN & Co.:—It affords me much pleasure to bear testimony to the able and efficient manner in which you have discharged your duties of Solicitors of Patents while I had the honor of holding the office of Commissioner. Your business was very large, and you sustained (and, I doubt not, justly deserved) the reputation of energy, marked ability and uncompromising fidelity in performing your professional engagements. Very respectfully,

Your obedient servant, J. HOLT.

Messrs. MUNN & Co.:—Gentlemen: It gives me much pleasure to say that, during the time of my holding the office of Commissioner of Patents, a very large proportion of the business of inventors before the Patent Office was transacted through your agency, and that I have ever found you faithful and devoted to the interests of your clients, as well as eminently qualified to perform the duties of Patent Attorneys with skill and accuracy. Very respectfully,

Your obedient servant, WM. D. BISHOP.

Notes and Queries

CORRESPONDENTS sending communications for publication in our columns are requested to avoid writing on both sides of a sheet of paper. This fault, though common to persons unaccustomed to writing for the press, gives great trouble to the printer (especially in long articles), and, when combined with illegibility of handwriting, often causes interesting contributions to be regretfully consigned to our waste-paper basket.

W. A., of Ohio.—If your statement is true we think your experiments well worth continuing.

T. B., of Ind.—The making of gas from wood is not new, neither is it an old rejected idea. Gas can be made from wood as well as from coal, the desirableness of either material depending on its price at the place of manufacture.

G. R. S., of Wis.—You doubt whether a rain gage with a horizontal mouth indicates correctly the fall of rain when the wind blows, so as to cause the rain to descend at an inclined angle. Supposing the ground was all covered with these gages, would they not catch all the rain, and would not each one catch its proper proportion?

H. B. M., of Conn.—There is no doubt that scale will be occasionally detached from steam boilers, either by the rusting of the iron or by its sudden expansion when quickly heated. But the former process is certain, and the latter very apt to injure the boiler.

P. H. W., of N. Y.—Your soil pulverizer appears to contain novelty sufficient to entitle you to a patent. If you wish to employ our agency in procuring the patent, please to send us a small model and the patent fee, $30.

G. R. D., of N. J.—We should think, judging from the description, that your machine for forming fur hat bodies contained patentable novelty, but we fear that you have forfeited your right to obtain a valid patent by allowing your invention to be used publicly for more than two years. If the purchase, sale or prior use has been for more than two years, you could not obtain a valid patent for it. Inventors are oftentimes careless about this matter, and when too late, begin to stir about to secure their inventions by patent.

C. W. G., of N. Y.—The statements which have been made to you respecting the Canadian Patent Law are erroneous and your adviser must have been wholly ignorant of the subject. We have examined the law carefully, and unless you are a resident subject and the inventor of the device for which you desire to procure a patent you cannot obtain the grant. You could not obtain a valid patent except by special act of Parliament. This system is more odious towards foreigners than ours, and we would gladly see it speedily repealed.

D. O. W., of Va.—We would not advise you to make application for a patent on your tobacco press. The nature of the invention is the same as many other presses, models of which are now in the Patent Office. We have sent you by mail a pamphlet of hints to inventors; also a circular about foreign patents. We advise you not to bother your head about a flying machine. Your ideas on the subject are crude and erroneous.

R. M. S., of N. C.—Your mathematical problem is easily solved by plane trigonometry and algebra.

L. C. H., of Ohio.—You had better send us a model and description of your machine for dressing cut, sawed and rived staves. We believe a patent may be obtained for it.

W. C., of Pa.—You cannot obtain a patent for an endless chain-cutting mowing machine It is already patented. Your caloric engine is not like Ericsson's. We do not think it will work as you suggest.

C. McF., of Fla.—Articles of brass and copper are silvered in a solution of cyanide of silver, connected with a galvanic battery. Iron and steel articles can also be silvered by giving them a coat of tin first, then placing them in the cyanide solution connected with the battery.

W. S. L., of Ill.—Considerable leather is now made without the use of bark by substituting catcheen, a tanning substance obtained from the East Indies. It comes in the form of irregular blocks, about a cubic foot in size; it has a crystalline appearance like brown resin, is soluble in hot water, and is applied in vats like the extract of hemlock bark. Messrs. Robinson and Eggleston, of Waukesha, Wis., have obtained a patent for a good method of tanning with catcheu.

J. A. A., of Miss.—The sketch which you have sent represents a ring, on which is mounted eleven permanent magnets that are made to revolve under a single helix connected with an electro-magnet. You inquire whether a current of electricity thus generated is sufficient to operate a telegraph. We think it is not. You will find an improved arrangement of such a machine illustrated on another page. Several years ago a magneto-electric machine was employed for a short period to work a line of telegraph in France, but it was given up for the old battery. The fault may have been in the machine, not the principle of action.

T. D., of Pa.—The American Institute did not hold a mechanical fair this Fall. The managers, from motives of prudence, thought best to defer a mechanical exhibition, and in its stead had a show of flowers. We are not advised whether it intends to become a horticultural society in future or not.

P. P., of Ind.—You will find an illustration and description of Fawke's steam plow on page 161, Vol. I. (new series), of the SCIENTIFIC AMERICAN. We can furnish you with a bound volume for $1 50. There remains yet much to be done to adapt the steam plow to the use of farmers. Large farmers can employ a portable steam engine for many purposes. Now, what is wanted is to adapt it to the plow, and make it efficient and economical.

B. E. A., of Ohio.—We are decidedly of the opinion that your alleged improvement in coal oil retorts is new, and that a patent can be obtained for it. We cannot proceed without a model. Petroleum is used as a solvent of sulphur, phosphorus, resin, &c.

H. H., of Mass.—Your communication is altogether too long for our columns. You can clearly state the whole matter in a single page. Then, why use so many unnecessary words?

MONEY RECEIVED

At the Scientific American Office on account of Patent Office business, for the week ending Saturday, Oct. 27, 1860:—

R. F. H. H., of N. J., $100; S. M. S., of Conn., $250; G. P. H., of N. Y., $22; E. P., of Mass., $28; G. P. K., of Mo., $30; S. M., of N. Y., $30; B. D., of N. Y., $950; H. B. W., of Conn., $30; A. M., of N. Y., $20; J. G., of Pa., $25; S. L. W., of N. C., $25; S. F. H., of Ill., $50; W. S., of Pa., $20; S. & C., of Ohio, $50; M. L. P., of Texas, $50; L. A. G., of N. Y., $30; L. F. F., of N. Y., $55; W. H. W., of N. Y., $ 30; H. B. T., of Wis., $25; N. & H., of Pa., $25; J. O., of Pa., $17; J. L., of N. Y., $30; S. S. & T., of Pa., $30; D. T., of Mass., $100; H. N., of N. Y., $30; J. M. R., of Ky., $30; J. W. L., of R. I., $10; V. & K., of N. Y., $30; G. & G., of N. Y., $30; W. & G., of Va., $12; W. & W., of Ala., $10; J. L. F., of Iowa, $50; F. B. P., of Mo., $40; B. & M., of Ill., $30; L. & K., of Ill., $20; G. U., of N. C., $58; C. G. S., of Mass., $25; C. T. W. S., of Fla., $25; N. & McC., of N. Y., $20; J. A. G., of Mass., $25; J. A. C., of Ohio, $50; L. F. M., of N. Y., $15; J. A. A., of Mass., $25; P. C., of N. Y., $40; W. H. S., of Conn., $30; J. M. S., of Ind., $25; J. L. Ve., of Ohio, $30; J. E. G., of Ill., $50; W. S., of Mass., $30; A. & J., of Tenn., $30; J. M. A., of La., $30; A. M., of N. Y., $10; B. D. T., of N. Y., $30; J. B., of N. Y., $25.

Specifications, drawings and models belonging to parties with the following initials have been forwarded to the Patent Office during the week ending Saturday, Oct. 27, 1860:—

G. U., of N. C.; B. M., of N. Y.; H. B. T., of Wis.; J. A. G., of Mass.; W. W. G., of Miss.; W. H. N., of Conn.; L. F. F., of N. Y.; P. H. S., of Cal.; S. L. W., of N. C.; G. P. H., of N. Y.; N. & H., of Pa.; C. T. W. S., of Fla.; J. B. C., of Ohio; J. O., of Pa.; S. La F., of Ohio; L. F. M., of N. Y.; W. C. W., of N. Y.; S. F. H., of Mich. (2 cases); J. W. G., of Pa.; A. L. P., of Paris; H. G., of Ill.; J. B., of N. Y.; J. G., of Miss.; C. G. S., of Mass.; J. M. S., of Ind.; W. & G., of Va.; L. J., of N. H.

USEFUL HINTS TO OUR READERS.

BACK NUMBERS AND VOLUMES OF THE SCIENTIFIC AMERICAN.—New subscribers to the SCIENTIFIC AMERICAN can be furnished with the back numbers of this volume by signifying their wish to receive them, otherwise their paper will be sent from the date of receiving the subscription. Vols. I. and II. (bound or unbound) may be had at this office and from all periodical dealers. Price, bound, $1 50 per volume; by mail, $2, which includes postage. Price in sheets, $1. Every mechanic, inventor, or artisan in the United States should have a complete set of this publication for reference. Subscribers should not fail to preserve their numbers for binding.

SUBSCRIBERS TO THE SCIENTIFIC AMERICAN who fail to get their papers regularly will oblige the publishers by stating their complaints in writing. Those who may have missed certain numbers can have them supplied by addressing a note to the office of publication.

GIVE INTELLIGIBLE DIRECTIONS.—We often receive letters with money inclosed, requesting the paper sent for the amount of the enclosure, but no name of State given, and often with the name of the Post-office also omitted. Persons should be careful to write their names plainly when they address publishers, and to name the Post-office at which they wish to receive their paper, and the State in which the Post-office is located.

BOUGHTON'S IMPROVED HUB BAND.

Before improvements began to be made in hub bands, however elegant the finish of a carriage in other respects, there was always one portion of it which was greasy, dirty and unsightly—the end of the axle at the middle of the hub. As it is necessary to keep the axle greased, and as carriages are exposed to dust, the accumulation of dirt at this place seemed to be a necessary consequence. But the difficulty, like so many others, has been surmounted by the intensely inventive activity of the present century. Of all the plans devised, the one which (in practice) has proved to be the best is the screwing of a tight cap into the end of the hub, so as to completely conceal the nut on the end of the axle, protecting it effectually from the entrance of dust from the outside, preventing the escape of grease, and making this ugly spot not only perfectly clean, but the most ornamental part of the whole carriage. A silverplated band is placed around the end of the hub, with a rim turned down over the end, and into this rim is firmly screwed a silverplated cap. This form of hub band has proved so superior to all others that it has gone into almost universal use, and there are several large establishments in the country engaged in its manufacture. There are, however, some important objections to securing the cap by screwing it into the end of the band.

Fig. 1

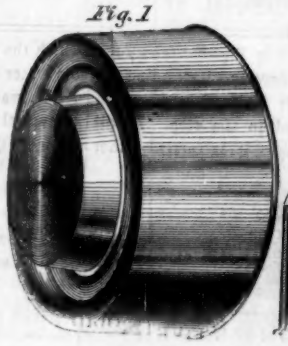
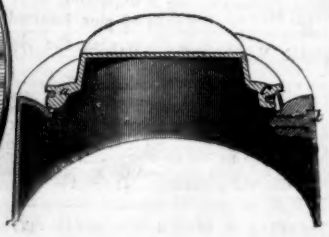


Fig. 2



BOUGHTON'S IMPROVED HUB BAND.

1st. It is necessary to make a square or octagonal projection from the cap for the wrench to grasp, and this gives a heavy and clumsy appearance to the wheel, materially marring the beauty and elegance of the carriage.

2d. The action of the wrench upon the projection soon wears off the plating, exposing the brass beneath, and making the carriage look worn and old.

3d. The action of the wrench in taking the nut from the axle wears away the threads in the band which holds the cap in place.

4th. The opening in the band is of too small size to allow convenient access to the nut in the frequent operation of greasing the axle, and as a wrench must be made for each size of nut (the sizes are not in practice varied with the size of the hub), caps of only four sizes being, in fact, made for hubs of all sizes, from 2½ to 5 inches.

All of these difficulties are overcome in the most effectual manner by the hub band here illustrated, which was invented by James A. Boughton, of Poughkeepsie, N. Y., and patented Nov. 29, 1859. The cap, instead of being screwed into the band, is made to fit into a rabbet-shaped depression in the edge of the hole through the end of the band, where it is held in place by means of a lip and small screw. The lip, *a*, on one side of the cap has a groove to receive the edge of the band, and the screw, *b*, passing through the band, enters a hole in the enlargement, *c*, on the side of the cap opposite to the lip, *a*. The hole in the enlargement, *c*, for the reception of the end of the screw, has no thread, but is made tapering to receive the conical end of the screw, which presses into it in a wedge-like way, forcing it against the edge of the band, and holding it in the firmest possible manner in its place. The cap is represented in the drawing a little out of place, to show the parts more clearly. By this plan no wrench, specially adapted for the purpose, is required, but the cap is removed by an ordinary screw-driver. Besides the essential qualities fully developed in the above description, the prevention of the wearing of the cap or of the hole through the band by the wrench, and the obtaining of a large opening through the band for taking off the nut from the axle, an incidental advantage of this band of no small importance is the securing of the neat, light, beautiful and elegant finish to the hub represented in Fig. 1 of the engravings.

The patent for this invention has been assigned to Hannah & Storm, of Poughkeepsie, N. Y., manufacturers of the bands, to whom inquiries for further information in relation to the matter may be addressed. The trade name which they have given to this band, and by which it may be designated in orders, is the "Champion Band."

COMBINATIONS OF MANURES.

Immense quantities of nitrate of soda are imported into England for agricultural fertilizing. George Ville has examined the question of the policy of employing this nitrate. He finds that soda is found naturally in greatest abundance in marine plants, and that it diminishes as we recede to the interior of countries, where it disappears as a principal element. He finds that, although potash may in many cases be substituted for soda, soda cannot so well be substituted for potash. In experimenting with wheat, he found that the addition of potash caused double the yield that soda gave; but if a silicate of potash be added to the nitrate of soda, the result is the same as that obtained from nitrate of potash. His conclusions are that the nitrate of soda, mixed with phosphate of lime, is not very efficacious as a fertilizer, but that the addition of potash immediately communicates great efficiency

HARRIS' IMPROVED HEEL GUARD FOR OVERSHOES AND BOOTS.

A great annoyance in muddy weather results from the soiling of one's clothes by the mud which is spattered on the heel in walking, and we are sure that large numbers of our readers of both sexes—especially ladies—will be grateful to the inventor who has, by a very cheap and simple contrivance, effectually protected us from this annoyance.

This is accomplished by making the overshoe with a hood-shaped shield upon the heel, as illustrated in the annexed cuts. The shield, *a*, made of the same material of the overshoe, or of other suitable material, is, in the process of manufacture, cemented to the heel near the top and at the sides, and extends down sufficiently to protect the pantaloons or dress, but not far enough to enter the mud. The water or mud which is

Fig. 1

Fig. 2

thrown up by the foot strikes against the underside of the shield; and thus the outer side, which comes in contact with the clothing, is kept perfectly dry.

This is one of those little improvements in an article of universal use which are the most certain to pay large profits to the inventor. And this seems to be the inventor's opinion, for he has secured patents for it (through the Scientific American Patent Agency) in Great Britain and France, as well as in this country—the American patent dated June 5, 1860—and has also made arrangements to have a number of pairs made for the royal family of Great Britain. Further information in relation to the matter may be obtained by addressing the inventor, William A. Harris, at Providence, R. I.

PRACTICAL DIRECTIONS FOR MARINE ENGINEERS.

We have already noticed favorably the work of W. H. King, of the United States navy, on Steam and the Steam Engine, published by Frederick A. Brady, of this city, and now, by the consent of the author, we extract some of his practical directions in case of casualties. We shall continue these extracts in subsequent numbers of our paper.

How to act if the Eccentric be Broken in an Irreparable Manner.

If there be two paddle engines connected at an angle of 90°, connect the starting bar of the deranged engine, by means of a line and guide pulleys, to the cross-tail, air-pump beam, air-pump cross-head, or other part having motion coincident with the piston of the other engine, to give the bar motion in one direction, and attach a heavy weight to it, with a line running over a pulley, to give it motion in the opposite direction.

If there be but one engine, connect by similar means to the connecting rod of the deranged engine, which will give the proper motion.

How to act when a Steamer springs aleak and commences to fill rapidly.

Put on immediately all bilge injections and bilge pumps, and shut off all other injections. If they do not keep the water down, break the joints on the bottom or side injections, and allow them to draw water from the bilge, taking care to station a man at each one to prevent anything from passing in that would choke the valves.

Vessels are sometimes saved from foundering by covering the leak with a sail-cloth passed over the bows and under the bottom.

If the leak be a large one, such as one occasioned by a collision, it may be possible to force a mattress, or something of that natnre, into it from the outside.

THE *Medical and Surgical Reporter*, of Philadelphia, states editorially that chloroform is very rapidly going out of use as an anaesthetic agent in consequence of the great danger attending its administration, its place being supplied by ether, which is admitted to be almost absolutely safe.